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# INDONESIA ENERGY ASSESSMENT



**November 22, 2008**

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Source: Energy Information Agency, Indonesia Country Profile, 2006.

# INDONESIA ENERGY SECTOR ASSESSMENT

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# TABLE OF CONTENTS

<b>1</b>	<b>EXECUTIVE SUMMARY.....</b>	<b>9</b>
<b>2</b>	<b>INTRODUCTION.....</b>	<b>14</b>
<b>3</b>	<b>ENERGY PROGRAM DRIVERS.....</b>	<b>16</b>
3.1	CLimate Change.....	16
3.2	Economic Growth .....	20
<b>4</b>	<b>SECTOR DESCRIPTION .....</b>	<b>24</b>
4.1	Energy Supply .....	24
4.1.1	Power Generation and Distribution .....	24
4.2	Energy Demand .....	25
4.3	Policies and Institutional Framework.....	26
4.3.1	Liberalization and Restructuring of the Energy Sector.....	28
4.3.2	Energy Efficiency and Demand-Side Management .....	29
4.3.3	Renewable Energy Policies.....	30
4.4	Institutional Framework.....	31
4.4.1	Government .....	32
4.4.2	Utilities.....	34
4.5	Donor Engagement.....	38
4.5.1	World Bank.....	38
4.5.2	Japan International Cooperation Agency .....	39
4.5.3	Asian Development Bank .....	39
4.5.4	Danish International Development Agency (DANIDA) .....	40
4.5.5	Australia.....	40
4.5.6	The EC-ASEAN Energy Facility (EAEF) .....	40
4.5.7	International Finance Corporation.....	41
<b>5</b>	<b>GAP ANALYSIS .....</b>	<b>42</b>
5.1.1	Policy and Regulation .....	42
5.1.2	Technical and Economical Aspect.....	43
5.1.3	Institutional and Stakeholder's Capacity .....	44
5.1.4	Sector Specific Barriers.....	44
<b>6</b>	<b>RECOMMENDATIONS.....</b>	<b>47</b>

6.1	Strategic Approach.....	47
6.1.1	USAID's Comparative Advantage.....	47
6.1.2	Opportunities and Expected outcomes.....	48
7	<b>APPENDIX A: ADDITIONAL FIGURES AND TABLES .....</b>	<b>57</b>
8	<b>REFERENCES.....</b>	<b>69</b>





# ACRONYMS

ADB	Asian Development Bank
AFRD	Indonesian Agency for Forestry Research and Development
ASEAN	Association of Southeast Asian Nations
BAKOREN	Badan Koordinasi Energi Nasional
BAPPENAS	National Development Planning Agency - Bureau for Electricity, Energy Development and Mining
BPMIGAS	Coordinating Ministry of Economic Affairs (Menko Perekonomian)
BPPT	BPP Teknologi (Agency for the Assessment and Application of Technology)
BSN	National Standards Bureau
CCT	Clean Coal Technologies
CDM	Clean development mechanisms
CFLs	Compact fluorescent lamps
CGN	Compressed Natural Gas
CO <sub>2</sub>	Carbon dioxide
COE	Cost of energy production
CSR	Corporate social responsibility
DANIDA	Danish International Development Agency
DEN	Dewan Energi Nasional (National Energy Council)
DG MIGAS	Directorate General for Oil and Gas
DGEEU	Directorate General for Electricity and Energy Utilization of the MEMR
DNA	Designated National Authority
DNPI	National Council of Climate Change
DSM	Demand-side management
EAEF	EC-ASEAN Energy Facility
EC	European Commission
EPC	Engineering, Procurement and Construction
GEF	Global Environment Facility
GHG	Greenhouse gas

GOI	Government of Indonesia
GTZ	German Agency for Technical Cooperation
GW	Gigawatts
IDR	Indonesian rupiah
IFC	International Finance Corporation
IGCC	Integrated Gasification Combined Cycle
IMIDAP	UNDP-GEF Integrated Micro-hydro Program
IPP	Independent Power Producer
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KEN	National Energy Policy (Kebijakan Energi Nasional)
KUDs	Koperasi Unit Desa (village-based cooperatives)
LEMHANAS	National Resilience Institute
LMK	Electric Power Technical Services
LNG	Liquefied natural gas
MD	Ministerial Decree
MDOAE	Mandatory Disclosure of Automotive Emissions
MEMR	Ministry of Energy and Mineral Resources, formerly MME
MFO	Ministry of Forestry
MHPP	German-Indonesian Mini Hydro Power Project
MOC	Ministry of Cooperatives and Small Enterprises Development
MPW	Ministry of Public Works
MSAs	Management Service Arrangements
MW	Megawatts
NC-CDM	National Commission for Clean Development Mechanism (Komisi Nasional Mekanisme Pembangunan Bersih)
NGOs	Non-Governmental Organizations
OPEC	Organization of Petroleum Exporting Countries
PDD	Project Design Document
Perpres	Presidential Regulation
PT PLN (PLN)	Perusahaan Listrik Negara
PPA	Power Purchase Agreements

PPP	Public-private partnership
PREGA program	Promotion of Renewable Energy Efficiency and Greenhouse Gas Abatement
RE	Renewable Energy
RENI	Renewable Energy Network Indonesia
RIKEN	Rencana Induk Konservasi Energi Nasional (Master Plan on National Energy Conservation)
RUKN	National Electricity General Plan
SHS	Solar home systems
SNI	Standar Nasional Indonesia
SPPA	Small Power Purchase Agreement
TA	Technical assistance
TDL	Tarif Dasar Listrik
UNDP	United Nations Development Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank
YBUL	Yayasan Bina Usaha Lingkungan



# 1 1HEXECUTIVE SUMMARY

The energy sector in Indonesia has struggled to keep up with the rapid pace of economic growth. Chronic underinvestment in systems improvements and new generation capacity, coupled with highly subsidized fuel and electricity rates, has left Indonesia in a dire situation. As Indonesia looks to meet the energy needs of an expanding economy, and provide energy services to currently unserved populations, it is vital that steps are taken reduce carbon emissions without placing undue financial burdens on the sector. At the request of USAID/Indonesia, an energy sector assessment was performed from October 27 – November 7th. The objective of the assessment was to identify a menu of potential clean energy activities which could be supported under USAID's Climate Change program.

This assessment team interviewed a broad cross sections of stakeholders in the energy sector in an effort to understand the true barriers to clean energy development in Indonesia. Although activities in all energy sectors were considered, the assessment team's expertise was in the electricity sector and therefore this report primarily focuses on opportunities in this sector. If the Mission wishes to support activities in the transport or industrial sectors, where significant carbon reduction potential also exists, additional program design will be required. The assessment team strove to identify opportunities where minimal USAID investment could catalyze transformation to a low carbon development trajectory. The recommendations attempt to incorporate significant lessons learned from past and present activities, to build on current programs where possible, and to exploit synergies with other donor programs and multilateral agencies.

This report presents a range of potential options for consideration during the Mission's Strategy development process, but a more detailed program design will be required before an energy sector support program can be procured.

The assessment identified several key barriers to clean energy development in Indonesia including:

## **Policy and Regulation**

- *Oil price subsidy.* The Government's political decision to retain the oil price subsidy has hampered other energy programs and remains a major barrier for energy diversification and conservation. The relatively low prices of oil and electricity have been major barriers to energy conservation campaigns over decades.
- *Uneconomical nation-wide electricity tariff.* The Government's political decision to hold electricity tariffs constant since July 2003 and to apply a nation-wide uniform electricity tariff (TDL) continue to mask the true cost of supplying electricity to consumers, and make the sector non-bankable. These policies also hamper the expansion of electricity production capacity and make the sector inefficient. The non-cost reflective tariff in Indonesia presents the single greatest barrier to clean energy development.
- *Lack of policy/regulatory coordination.* Several stakeholders in the country are working on various rural electrifications programs with competing government departments, varying

procedures, and diverse financing sources. Unfortunately, there is no effective coordination among the different players. There is also legal and regulatory ambiguity surrounding the responsibility for rural electrification.

- *Lack of policy/regulatory enforcement.* Lack of enforcement in environmental regulation is observed in the implementation of PLN's 10,000 MW fast-track program. PLN selected winners from the initial tenders for 10,000 MW of new coal-fired power plants to be built over the next three years that did not comply with national standards. In particular, NO<sub>x</sub> standards require less than 750 ppm but the accepted bids only proposed 1,200 ppm. Similarly, the Government has initiated the establishment of an energy efficiency standard, but in its implementation, lack of enforcement mechanisms has hindered its widespread application both at the industrial and consumer level.
- *Lack of priority in energy utilization.* Although Indonesia is the world's sixth largest natural gas producer and supplies about a quarter of the world's liquefied natural gas from its fields in Aceh and Kalimantan, until recently the abundance of cheap oil limited the domestic utilization of clean natural gas.
- *Lack of fiscal incentives for new technology and renewable energy utilization.* There was no fiscal incentive provided for the utilization of new energy technology and RE in Indonesia. The duties, taxes, and other fees that are ordinarily payable on imported goods (customs duties of about 10 percent, VAT of about 10 percent, and import income tax of 2.5 percent of the import value) are applicable to new technology and RE as well.

#### **Technical and Economical**

- *Lack of transmission capacity.* Power systems in Indonesian islands are characterized by lack of long-haul interconnecting transmission networks. The need to develop long new transmission lines to connect the RE power plants (Java has especially large geothermal energy potential) with the load center has increased the cost of utilizing the RE resources.
- *Low load factor.* The average power system load factor in Indonesia by 2006 is about 64 percent, varying from 34 percent in North Sumatera to about 91 percent in Jambi (eastern part of Sumatera). This low load factor has made it difficult for PLN to expand its base load generation capacity. Since RE energy power plants sourced from run-of-river and geothermal resources are usually more economical to operate as base load generators, outside the Java-Bali system PLN tended to construct diesel power plant for capacity expansion.
- *PPA pricing.* Pricing of electricity for purchase by PLN from private producers has been one of the most significant barriers to renewable energy IPP. PLN was required to purchase electricity-based on a tariff formula that used the nationwide uniform tariff (TDL) as a reference. This regulation has made small and renewable PPA non-bankable, as the price did not truly reflect the cost of supply. New reference prices based on local cost of supply were introduced in 2008 to overcome this problem. Its implementation by PLN regional units is yet to be confirmed.
- *Investment cost for clean coal and renewable technology.* The cost of clean coal technology (e.g. supercritical technology) and renewable energy is greater than the cost of conventional coal technology (e.g. pulverized coal, PC). With its retail electricity tariff frozen by the

Government since 2003, PLN has not been able to pass-through the cost of developing clean-coal technology to its customers; thus, PLN continues its use of cheaper conventional coal technology.

- *Losses from new customer connection.* Rural electrification is not financially attractive to PLN because Indonesia's off-grid areas are sparsely populated, have very low load factor, and are dominated by low-end household consumers who are charged a heavily subsidized tariff (average revenue for household consumer was about IDR 628/kWh in 2006). Most off-grid (isolated) regions are supplied by diesel power plants that consume high-priced diesel oil. This increases PLN's cost of production far above IDR 2,000/kWh.

### **Institutional and Stakeholder's Capacity**

- *Lack of institutional capacity.* Both central government and sub-national governments lack the capacity to formulate and effectively implement policies and regulations. Weak political commitment and lack of budget support have diminished the capacity of government institutions and staff to execute policy and enforce regulations.
- *Lack of resources for project development.* Substantial skills, knowledge, and budget support are required to prepare, obtain financing, and implement energy projects. These resources are not readily available to central and sub-national governments and, to some extent, PLN regional units.

Indonesia benefits from significant donor support for the energy sector. The World Bank, Asian Development Bank, JICA/JBIC, GTZ, DANIDA, and IFC all have active energy sector support programs working to overcome the barriers detailed above. USAID re-engagement in the energy sector must be justified both by opportunities for catalytic reform and by a clearly defined comparative advantage to current players in the energy sector. The following factors argue for USAID reengagement in the energy sector:

- History of Energy Sector Support
- Flexibility to work with a variety of stakeholders
- Focus on Technical Assistance
- Willingness to work behind the scenes
- Geographic Flexibility
- Unique capabilities/investment interests of US Industry

The assessment team identified the following specific recommended activities which should be considered in the context of an overall Mission climate change strategy:

**Electricity Tariff Reform:** Electricity tariff reform is the single most important factor which could lead to accelerated clean energy development in Indonesia. Increase of the electricity tariff is a politically charged topic which has repeatedly been delayed in favor of political expediency. In 2004, plans to increase the tariff to \$0.08/kWh were scrapped as a result of the pending elections. Several stakeholders believe that one of the best opportunities for increasing the tariff will be during the first two years of a new administration. With elections scheduled for 2009, the time might be right to support an electricity tariff reform program, focused on impact analysis, TA, and a public information campaign targeting specific stakeholders known to oppose tariff increase.

**Small Scale Renewable Independent Power Producers:** Decentralized renewable energy systems remain the most cost-effective options in many rural areas and should attract private investment as the government continues to address the regulatory framework for selling power to PLN. Indonesia's geography and natural resources provide some of the most favorable conditions for renewable energy development in the world. Although Indonesia has made progress developing some of its geothermal and hydro resources, significant opportunity remains. One particular area of opportunity is to develop renewable resources to power some of the 600 mini-grids operated by PLN outside the Java-Bali network. PLN operates a total of 4700 diesel gensets comprising 44 percent of outer Jamali generation capacity. Development of renewable resources for these isolated grids has three advantages: 1) provides additional generation capacity in rural areas which will allow PLN to extend the grid to unserved areas, 2) provides a cheaper alternative to the currently used diesel generation allowing PLN to reduce operating costs, and 3) provides a low carbon alternative to fossil fuel based generation to meet Indonesia's growing electricity demand.

**Climate Change Strategy Development:** Indonesia's political, planning, and budgeting calendars and recent institutional changes and developments are creating strategic opportunities for engagement on climate change issues with the GOI. In conjunction with the newly elected administration in 2009, the GOI will be developing a new strategic plan for the period 2009-2014 that provides the opportunity to integrate global climate change concerns with strategic choices for sustainable development involving energy sector investments, policy reforms, and inter-ministerial coordination. The National Council for Climate Change (NCCC), established in July 2008 now serves as the new focal point for climate change in Indonesia (replacing the Ministry of Environment) and will be taking on responsibilities for formulating integrated national policies, strategies, programs and actions for climate change mitigation as well as technology transfer and funding. As a new, inter-ministerial institution, USAID could engage with the Council by providing much needed institutional strengthening to develop the institutional capacity of the council and technical assistance to enhance its capabilities.

**Energy Efficiency Improvements:** Indonesia's energy intensity exceeds most neighboring countries and significant opportunities exist for energy efficiency improvements. A recent survey of the industrial sector indicated that nearly every major industrial sub-sector used more energy per unit production than competing countries. Although hundreds of energy audits have been conducted, few have been implemented. However, significant donor engagement in this sector, coupled with reduced incentives based on the subsidized electricity tariff, require further investigation of the feasibility of such an intervention before proceeding. Significant efficiency improvements could also be realized by improving PLNs distribution operations. USAID could focus on networks outside the Java-Bali grid which typically exhibit the worst performance and are not the target of current donor support. USAID has a long history of pairing U.S. and developing country utilities under a GDA with USEA to address such issues.

**Efficient Transport Program:** Several other non-electricity components of the energy sectors are major contributors to green house gas emission and warrant consideration for support. The transport sector is a major emitter of fossil fuel based greenhouse gases and is growing rapidly. Most of these emissions come from vehicle use, with key issues being the vehicle emissions standards and fuel quality standards currently in use. (Growth in vehicle ownership is also an issue, though expected for a developing country and less amenable to policy intervention.)



Although standards have been set they have not been implemented and the rapid increase in the number of vehicles is creating a new stock of vehicles that will only contribute further to growing emissions. Indonesia is well behind the region in terms of fuel quality standards and vehicles are not now complying with Euro 2 emissions standards. USAID could consider providing support for Indonesia in the development of fuel standards and transportation planning. USAID's past support of the dedicated bus lane in Jakarta is considered a success and could be replicated in other population centers in Indonesia.

**Cross Sectoral Clean Energy Support:** As the USAID/Indonesia Health and Environment program strategy develops, opportunities for cross-sectoral energy/environment/health programming should be maximized. For instance, development of institutional or household biogas systems can help improve sanitation, reduce deforestation, and reduce carbon emissions, and improve indoor air quality. Improved watershed management is a requirement for small scale hydro operation providing another opportunity for synergies between a future environment and energy program. Improved cook stoves and community scale development of biofuel crops such as jatropha provide other cross sector opportunities worthy of consideration.

## 2 INTRODUCTION

Indonesia hosted the Thirteenth Conference of the Parties (COP 13) on the United Nations Framework Convention on Climate Change (UNFCCC) in December 2007 in Bali. COP-13 was a significant event that raised the profile of Indonesia on the international stage and has elevated the prominence of the issues of Climate Change within the Government of Indonesia (GOI) and general population alike. The COP13 negotiations resulted in the Bali Action Plan, a critical step forward in shaping an international climate agreement to succeed the Kyoto Protocol, which expires in 2012. The Bali Action Plan also introduced the notion of “nationally appropriate actions” whereby developing countries in a new international agreement meet CO<sub>2</sub> reduction targets in ways that don't constrain their ability to reach their sustainable development goals. In the wake of the Bali negotiations, the GOI has become a leading voice in the UNFCCC process among developing countries as negotiations move toward a new global climate change agreement in Copenhagen in 2009.

On the domestic front the GOI has begun to mobilize institutionally to take advantage of the increased prominence of the climate change issue to develop, promote and implement domestic climate change policy and position itself to be a leader among developing countries on this issue. The GOI has recently established a National Council for Climate Change, produced a National Action Plan for Addressing Climate Change, published a report of its Development Planning Response to Climate Change and is working to prepare their second National Communication on Climate Change for the UNFCCC. In addition, the Ministry of Finance has stepped into a leadership role focusing on financial issues related to climate change by hosting a global Finance Minister's Dialogue featuring climate change issues, led an inter-ministerial working group on climate change and low carbon issues, is collaborating with the World Bank to develop a “Low Carbon Development Options” study that will integrate climate change and development objectives and is initiating the establishment of an Indonesia Clean Technology Fund, an equity enhancement fund for clean technology projects in Indonesia.

This robust and heightened interest and activity by the GOI on Global Climate Change Issues has caught the attention of the international donor community, and in particular the acute attention of the US Ambassador to Indonesia and the USAID Mission Director. Following directly from the Ambassador's active participation at COP13 in Bali and the interest by the Embassy and Mission to position Indonesia in a favorable position to be in line to receive consideration for financing clean energy programs from the new World Bank Clean Technology Fund, the Mission is keen to explore the potential for the development of a new Global Climate Change program with a component focused on clean energy.

In response, USAID Indonesia's Water and Environment Team is developing one component of its future strategy to incorporate appropriate and feasible climate change activities that support substantial aspects of the GOI Action Plan. With the knowledge that USAID/Indonesia, until recently, maintained a strong and highly successful program on clean energy, USAID/EGAT was requested to assist the Mission to evaluate the potential for re-building such a program as one pillar of a broader Global Climate Change program that could be mobilized quickly to ensure that USAID Indonesia would effectively meet new GCC earmark requirements with a

well designed programs that reduces greenhouse gas emissions by promoting energy efficiency and clean energy technologies.

## 3 3HENERGY PROGRAM DRIVERS

### 3.1 4HCLIMATE CHANGE

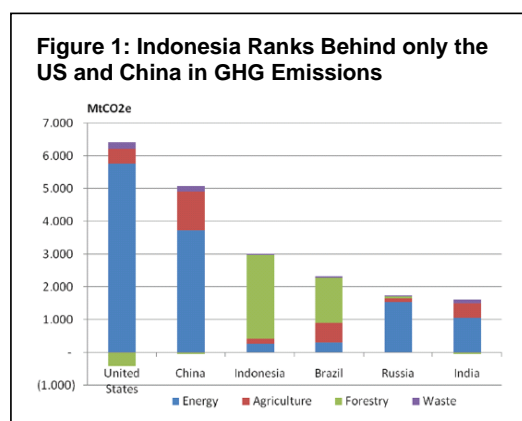
There are several significant drivers related to global climate change that argue for implementation of a clean energy program for USAID in Indonesia. These drivers include: Indonesia's current and projected future GHG emissions profile; the rate of growth of fossil fuel emissions, (particularly the planned growth of coal based emissions from the electricity sector); Indonesia's increasing GHG emission intensity; and the recent high level interest and rising profile of global climate change within the GOI and the international community combined with the increased recognition in the international climate and finance community of the need to enable and provide substantial new resources (public and private) for clean energy investments.

Climate change offers an attractive entry point, as well as increasing political visibility for programmatic assistance in the clean energy sector in Indonesia.

#### Indonesia is a significant emitter of Greenhouse Gases

Although emissions from land use changes and deforestation dominate the current GHG emissions profile of Indonesia (figure 1) there is no reason to expect major increases in this sector over time. In fact, if forests are depleted or controls on deforestation are successfully implemented, emissions from this sector will decline. In contrast, energy-related fossil fuel emissions in Indonesia are rapidly on the rise. The result is that energy-related fossil fuel emissions will one day be the dominant source in Indonesia's emissions profile. This means that near term efforts to slow the growth of GHG emissions in the energy sector should not be ignored as shorter term efforts focusing on curbing emissions from the land-use and forestry sectors are implemented. Near term efforts to develop clean energy will slow the growth in projected fossil fuel emissions and are critical to move Indonesia to a low carbon development path.

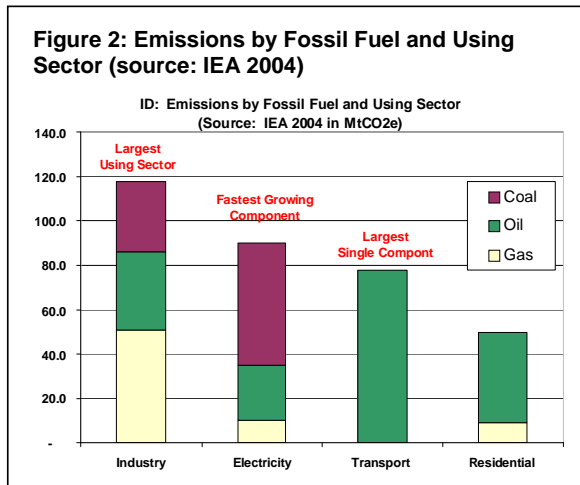
Indonesia currently ranks third in the world, after the US and China, as one of the highest emitters of greenhouse gases. When considering only fossil fuel combustion, Indonesia ranks among the top 25 CO<sub>2</sub> emitters; it is ranked 16<sup>th</sup> in GHG emissions when counting the EU as a whole. While at present, more than 90 percent of Indonesia's GHG emissions are from the forestry and land-use sector, the growth rate of energy sector emissions is the largest of any sector and therefore represent a significant concern for the future.



Emissions from fossil fuel combustion are growing at approximately 6 percent per year. Oil is currently the largest source of fossil fuel emissions, followed by coal. Emissions from coal, however, have been growing the most rapidly for any fuel type for the last decade. The fast rise of coal emissions is due to its increasing coal use for electric power generation. On a sectoral level, industrial activities are the largest source of

fossil fuel emissions. The electricity sector is close behind and will be growing quickly as a result of the planned expansion of coal-fired generating capacity. Emissions from the transportation sector, the largest user of liquid fuel, grew steadily but slower than the industrial sector. Residential sector is not a large user of coal or gas and hence emissions are relatively small and are due mainly to combustion of kerosene for home cooking. (Figure 2)

**Figure 2: Emissions by Fossil Fuel and Using Sector (source: IEA 2004)**

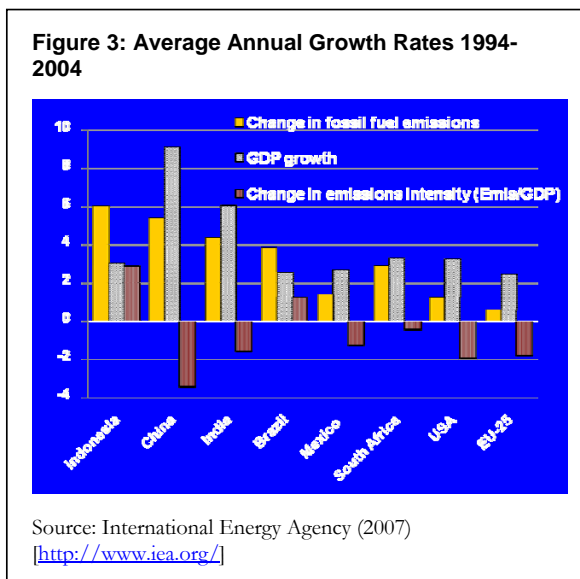


behind the significant increase in GHG emission intensity is the increasing role of coal in the electric generating sector.

### GHG Emissions Intensity

Indonesia's GHG emissions intensity, a measure of the level of emissions per unit of economic activity, is comparable to the world average, and still below the average for developing countries. In most countries, GDP has been growing faster than fossil fuel emissions, so emissions intensity has declined over time. However, Indonesia's GHG emissions intensity is increasing steadily, implying increasingly inefficient use of energy and/or a shift to fuels with higher levels of emissions (e.g., oil to coal). For Indonesia, the predominant reason

**Figure 3: Average Annual Growth Rates 1994-2004**

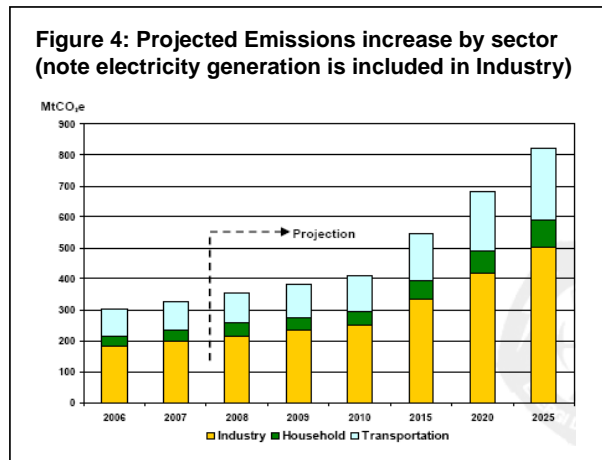


fuel in the industrial sector could continue for many years.

### Future Emissions

Emissions from fossil fuel use are growing rapidly at 6 percent per year, a rate which will cause a doubling of these emissions in about 12 years. By 2030, fossil fuel GHG emissions in Indonesia could be four times higher than present, on par with today's total emissions from land use and forestry. Thus, if these projections hold, fossil fuel emissions growth has the potential to offset any gains made through controlling Indonesia's deforestation rate. With current GOI investment plans focused on massive increases in coal fired power generation and the long lock in periods typical of these types of investments, this high level of growth in GHG emissions from fossil

The fast-track coal-fired generation expansion plans of the GOI and PLN dominate the discussion of future electricity supply and future potential GHG emissions. The fast-track power program seeks to bring an initial 10,000 Megawatts (MW) of new base load power on-line by 2011 with an additional 10,000 MW soon thereafter. The initial 10,000 MW plan is entirely coal-based, while the plans for the second 10,000 MW call for a mix of 30 percent cleaner coal and



70 percent renewables (mostly geothermal). About 40 percent of the contracts for the initial phase has been delayed due to high interest rates which are frustrating project finance. The remaining 60 percent of the contracts have been concluded with three large Chinese consortiums. Little attention was paid to environmental factors such as emissions and plant efficiency in the award of these contracts. Hence, this initiative will significantly increase the overall carbon intensity of the power sector and siphon off potential investments for clean

energy alternatives. As a result, domestic and international critics may question Indonesia's credibility as a 'leader' on climate change while these plans for expansion of 10,000 MW of 'dirty' domestic coal-based power generation continue to move forward.

### High level government interest and commitment to Climate Change

Indonesia achieved global visibility as host of the UNFCCC COP-13 process in 2007. In the wake of the Bali negotiations, the GOI has become a leading voice in the UNFCCC process among developing countries as negotiations on the Bali Plan of Action move forward toward a new global climate change agreement in Copenhagen in 2009. The GOI has also demonstrated leadership in the global Finance Ministers' dialogue process also initiated in Bali in 2007 where finance issues involving climate change have taken on greater predominance. In December 2007, the GOI produced a National Action Plan Addressing Climate Change and is currently working on preparing its Second National Communication to the UNFCCC. In June 2008, the GOI published its Development Planning Response to Climate Change ("Yellow Book"), outlining plans to integrate mitigation and adaptation into the national planning and budgeting process. In July 2008, the president established a National Council on Climate Change, with representation from 15 GOI Ministries.

The National Action Plan Addressing Climate Change (CCNAP) was prepared by the Ministry of Environment and launched in December 2007. The focus of mitigation efforts in the energy sector is primarily through regulation. Immediate recommended steps in energy policy include:

- a. Energy diversification including: supporting the development of new and renewable energy, reformulation of energy pricing to include the social and environmental costs, increasing the local roles in decentralizing the energy system, and building infrastructure for low emission technology.

- b. Energy conservation, which includes information dissemination, establish incentive and disincentive in the financial mechanism, regulatory measures and technical standards, and utilize science and technology to develop light weight, functional, efficient and have good quality products
- c. Implementation of clean technology by making use of CDM program and collaboration with other countries for implementation based on geographic position, population growth, economic growth, pattern and standard of living.

Recently, the National Council for Climate Change (NCCC) was established through Presidential Regulation. The NCCC is chaired by the President, while the Coordinating Minister for People Welfare and the Coordinating Minister for Economics Act as vice chairs. Mr. Rachmat Witoelar is the Executive Chairman of the council. The council has 17 ministers as its members. The tasks of the NCCC are (i) to formulate national policy, strategy, program and action in controlling climate change, (ii) coordinate related actions covering adaptation, mitigation, technology transfer and funding, (iii) formulate regulatory policy on mechanism and procedure for carbon trading, (iv) monitor and evaluate policy implementation on climate change control, and (v) strengthen Indonesia position to encourage developed countries to take more responsibilities in climate change control. The NCCC will serve as the focal point for climate change affairs in Indonesia, and the process of transfer from the previous focal point, which is the Ministry of Environment, is currently in progress.

Since May 2007, the Ministry of Finance has led an inter-ministerial working group that developed analyses and capacity on climate change and low carbon issues. Technical inputs and engagement across a wide range of agencies stimulated interest in MOF and GOI in policies and instruments that can be used to deal with climate change issues. This dialogue process has advanced the work on low carbon options by increasing demand, interest, and capacity for conducting the analysis, interpreting the results, and shaping effective policies. MOF is leading GOI collaboration with the World Bank on the development of a “Low Carbon Development Options” study that will evaluate and develop strategic options to address climate change mitigation issues without compromising development objectives.

The MOF has initiated the establishment of an Indonesia Clean Technology Fund, an equity enhancement fund for clean technology projects in Indonesia. The fund plans to raise \$225 million in private capital to be complemented by \$25 million from the GOI and would target medium and small scale clean technology investments through mezzanine project equity financing with the hope of linking to larger international clean technology investment vehicles such as the World Bank’s Clean Technology Fund.

### **International GCC**

New and potential future developments in the international global climate change community are also creating significant impetus for engagement in the GCC/clean energy sector in Indonesia. The UNFCCC negotiations process is on a path to conclude a new agreement in Copenhagen in 2009, based on the roadmap agreed to in Bali in 2007. There is an increasing degree of recognition and consensus, both within and outside the formal UNFCCC negotiation process, that addressing the impending crisis of global climate change will require appropriate mitigation actions on the part of developed and developing countries alike as well as significant

new financial resources for clean energy developments. During the next 25 years, the IEA (2006) estimates that investments of more than US \$6.2 trillion will be needed to build and maintain the energy supply infrastructure to satisfy projected demand in developing Asian economies (USAID/RDMA 2007). An estimated \$60 billion or more is needed to provide cleaner technology rather than least-cost equipment.

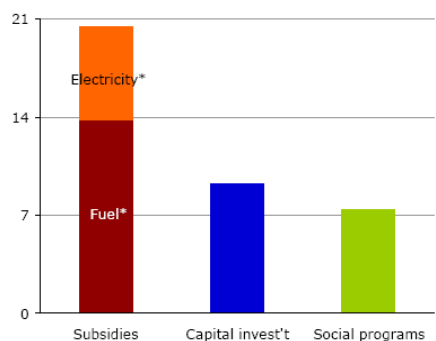
In advance of this expected new UNFCCC agreement, the World Bank has already established the Clean Technology Fund (CTF) with more than US \$6.1 Billion in pledges from developed countries. True to the anticipated spirit of a new climate change agreement, access to the resources of CTF by developing countries is conditional, requiring first the development a low-carbon development plan that is integrated with country-owned sustainable development objectives and strategies. Second, within this country plan, the fund will finance only transformational actions and projects that scale-up deployment, diffusion and transfer of clean technologies and accelerate their wide scale implementation.

The Ministry of Finance has become increasingly aware of the newly established and potential international financing mechanisms and sources that can be used for to finance climate-friendly investments, preparatory analyses, and incentives or seed money for innovations. The GOI has begun to consider the institutional and regulatory framework needed to benefit from international flows to create sound incentives, provide resources for programs, protect the poor and contribute to sustainable development.

### 3.2 5HECONOMIC GROWTH

Sustained economic growth in Indonesia is intricately linked to energy sector development. Indonesia has an energy intensive economy which results in a 1.8 percent increase in energy demand for every 1 percent increase in GDP. Electricity demand is forecasted to continue to grow at an average rate of around 6 percent per year – and PLN does not expect this value to decrease significantly as a result of the current economic crisis. (figure A1 and A2) Indonesia's failure to meet this demand growth with adequate system investments has resulted in increased frequency and duration of power outages which prove costly to local industries. Indonesia's underdeveloped energy sector also has a pronounced impact on rural economic development – where 40 percent of the population does not have access to modern energy services.

**Figure 5: Energy subsidies compared to other government expenditures**



Source: Ministry of Finance, 2008 APBN-P, assuming oil at US\$95; social program expenditure data from 2008 APBN

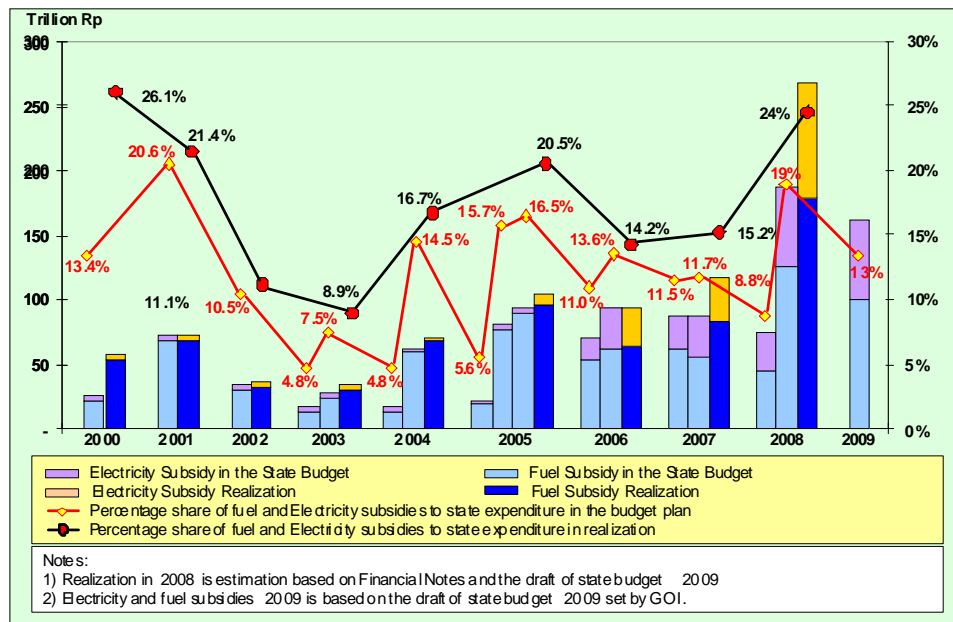
#### Macroeconomic Impact

Indonesia's energy sector remains highly subsidized creating a substantial drain on GOI budget resources. In FY 2008, nearly 25 percent of GOI expenditures were for fuel and electricity subsidies (table A1 and figure A3). As can be seen in Figure 5, this far surpasses government spending on social programs and greatly crowds out other critical capital investments. Although Indonesia has made some progress in reducing fuel subsidies, electricity tariffs have remained constant since 2003. This combined with increasing fuel prices



and the end of subsidy on PLN purchased diesel fuel has resulted in a marked increase in the electricity subsidy since 2006. From a budgeting standpoint, the volatile price of oil makes it difficult to predict the magnitude of the energy subsidies for any given year. (figure 6) It is difficult to imagine how Indonesia can meet the future energy sector demands without a fundamental reform of its tariff structure. Section 3.6.2 details the effect on the non-cost reflective tariff on PLN's operations. The effective de-capitalization of the sector prevents system modernization and expansion with long term economic ramifications that far surpass the impact of incremental tariff increase.

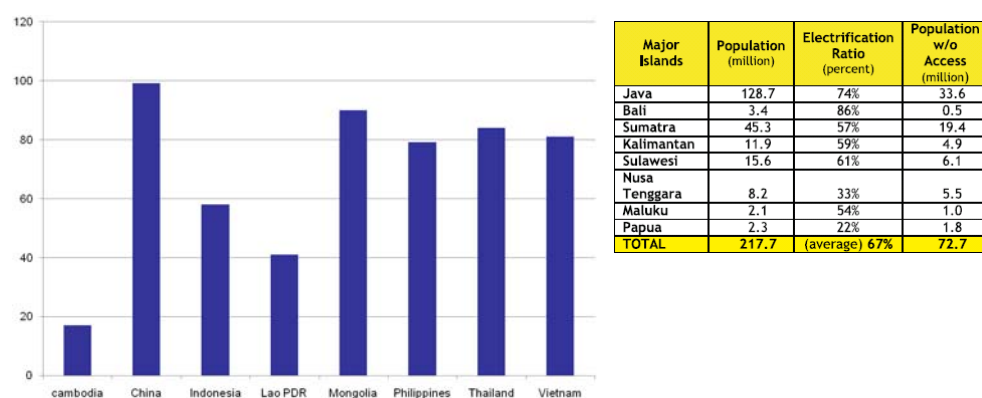
**Figure 6: Projected and realized fuel and electricity subsidy.**



### Rural Development:

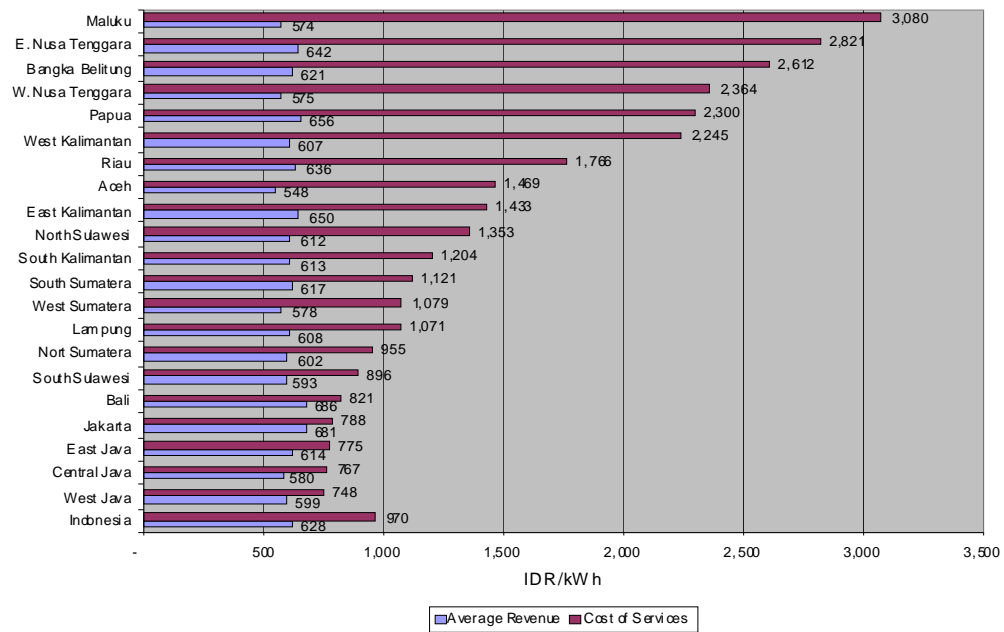
Over 90 million Indonesians (40 percent of the population) do not have access to electricity and two-thirds of these people live in rural areas. The electrification rate in Indonesia is low compared to many neighboring countries as can be seen by figure 7. The Government of Indonesia has set an ambitious goal to increase national electrification rates to 90 percent by 2020, requiring an average of 1 million new connections annually for the next 15 years. The World Bank has estimated that meeting this challenge will require \$4.6-6.4 billion in investment over the next 7 years alone, a figure far exceeding the financial capacity of PLN, the donor community, or international investment.

**Figure 7: Electricity access in Indonesia a) as compared to other Asian countries and b) by Island**



Extending rural electrification remains a challenge because of the country's geography, disperse populations and uniform tariff structure. At present, PLN has at least 30,000 units of 50 KW to 1 MW diesel generating sets scattered all over the archipelago, totaling around 500 MW. Given the high cost of diesel and the reduction in subsidies, PLN's generation costs far surpass revenue in many of these areas. Figure 8 shows PLN's cost of operation vs. revenue throughout Indonesia. Clearly, at current generation costs and tariff levels there is no commercial incentive to connect additional customers in many of these regions.

**Figure 8: PLN's average revenue and cost of service for different regions of Indonesia.**



## 4 6HSECTOR DESCRIPTION

### 4.1 7HENERGY SUPPLY

Indonesia is richly endowed with primary energy resources that are utilized to meet domestic demand as well as export requirements in the form of oil, liquefied natural gas (LNG), and coal.

Coal is Indonesia's largest fossil fuel resource, with proven reserves of 5,300 million tons of largely-low quality coal located mainly in Sumatera and Kalimantan. The Government of Indonesia plans to rapidly expand the domestic use of coal for electricity generation. Power generation and industrial use will continue to dominate coal utilization for the foreseeable future. However, the Government is actively developing coal briquettes to replace diesel for home cooking and is investigating coal liquefaction for transport fuels.

Indonesia is blessed with substantial renewable resources which are distributed throughout the country. (Figure A4 and Table A2). Renewable energy (RE) resources have been largely unexploited because of the high up-front costs, lack of infrastructure to produce and deliver electricity to load centers, and non-cost reflective electricity tariff. A portfolio of geothermal and hydro investments has been identified that could be developed over the next five to 10 years, along with facilities to generate power from biomass residues. The speed at which these resources are developed will depend heavily on the extent of environmental controls required for power generation from coal and tariff reform. Renewable systems remain the most cost-effective options in many rural areas and should attract growing investment as the Government refines and enforces the regulatory framework under which power is sold to PLN.

The GOI has set a target for biofuels to meet 10 percent of transportation needs by 2010. Palm oil is the most attractive option for biodiesel; blending with diesel will predominate, with some direct use of pure palm oil in diesel generators operated by PLN. Ethanol from sugar, molasses, or cassava can be blended with gasoline to meet the October 1, 2008 requirement that fuel distributors only offer biofuels – biopremium, biopertamax, or biodiesel. It is anticipated that this decree will create spur significant investment in the biofuel industry.

Indonesia has begun discussion on the introduction of nuclear power. Given the current high cost of nuclear capacity relative to the other power generation options and public resistance to nuclear power, it is difficult to forecast how quickly plans will develop. The first plant is planned for construction in Central Java, but protests have repeatedly delayed its construction.

#### 4.1.1 8HPOWER GENERATION AND DISTRIBUTION

Indonesia's installed generating capacity is estimated at 24.7 Gigawatts (GW), with 80 percent coming from oil, gas, and coal, 18 percent from hydropower, and 2 percent from geothermal. Indonesia is facing an electricity supply crisis due to underinvestment in power generation capacity.<sup>1</sup> Intermittent blackouts are a problem across Java. Demand for electrical power is

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<sup>1</sup> Prior to the Asian financial crisis of 1999-2000, Indonesia opened its power markets to Independent Power Producers (IPPs) and expected to rapidly expand installed power generation capacity. IPPs are discussed in further detail in "Barriers Section – Case Highlight".

expected to grow by approximately 6-7 percent per year. Efforts are underway to shift generation to lower-cost coal and gas-powered facilities, along with utilization of geothermal and hydropower. Hydropower plant capacity is expected to increase by 6.5 percent per year through at least 2010, while geothermal capacity should grow even faster at more than 10 percent per year.

In 2007, PLN's installed capacity represented only 56 percent of Indonesia's total (25,218 MW out of 44,767 MW); the remainder consists largely of captive power for the manufacturing industry. Diesel generators account for approximately 60 percent of captive power capacity, while cogeneration plants provide approximately 25 percent. Captive power may be a more efficient alternative to PLN supply for companies using process steam, and for the high peak loads required by extractive industries in the outer islands. (See Figure A5)

Inadequate investment in long-haul transmission remains a problem. For example, the 3,200-MW Paiton power plant in East Java, which is the country's largest, has inadequate transmission lines to central and western Java, limiting transmission of electricity from the plant to load centers.

## 4.2 9HENERGY DEMAND

Indonesia has enjoyed steady economic growth of around 5 percent since rebounding from the 1999-2000 crisis, despite steady increases in energy prices, especially crude oil.

Oil and gas continue to be the leading export sector, increasing to \$19.2 billion in 2005 from \$17.6 billion in 2004. However, despite being an exporter of crude oil, Indonesia is now a net importer of oil. Indonesia, the only Asian member of the Organization of Petroleum Exporting Countries (OPEC) and the only member outside of the Middle East, is the only OPEC member that is a net oil importer. Its fuel production has declined over the years, owing to aging oil fields and lack of investment in new equipment. Indonesia remained the world's leading exporter of LNG in 2005, with 18.8 percent of the world market allowing it to remain a net exporter when both oil and gas are considered. Oil and gas imports increased to \$17.4 billion in 2005 from \$12.1 billion in 2004.

As mentioned earlier, oil and domestic gas remain subsidized.

The energy sector in Indonesia requires major infusions of capital to achieve government objectives and it is hard to envision how this capital will be mobilized under the current fuel and electricity pricing structure. Major areas requiring new capital are discussed below.

*Power Sector:* Indonesia's demand for electricity is expected to continue its recent pace of 6 percent annual growth over the next decade. This rapid demand growth has already caused power supply shortages, especially outside the main Java-Bali grid. Priorities for power sector expansion include constructing 10,000 MW of coal-fired power plants in East Java, Aceh, Sumatera, and N Sulawesi, at a cost of \$11 billion, with the first 2,000 MW expected to generate in 2009.

The massive investment in coal-fired plants will substantially increase the carbon dioxide (CO<sub>2</sub>) intensity of the power sector, as coal-fired power plants are substituted for retired oil-fired capacity. There is thus a need to re-balance PLN's resource portfolio by introducing more gas-fired power generation and scaling up clean energy sources including hydro and geothermal. With PLN's and GOI's financial resources already stretched by the ambitious coal power plant expansion program, it is unclear who can meet these additional financing requirements.

*Rural Electrification:* The financial crisis in 1997 slowed what had been significant progress towards providing electricity access to Indonesia's rural population. Most power supply outside the main grids depends on diesel generators. Renewable sources available in many rural areas are less expensive than diesel generators and offer an attractive way to reduce the drain of subsidies on the national budget. But the challenge of negotiating agreements with PLN, despite new regulations and instructions, discourages investment. The Government has committed to reduce electricity subsidies and to further clarify regulations. Continued subsidized prices for electricity will make it difficult to expand electrification.

*Key Consuming Sectors and End Uses:* The APEC Energy Demand and Supply Outlook 2006 projects Indonesia's final energy demand will grow at 2.9 percent per year, to 247 Mtoe in 2030, more than double the 2002 level of 112 Mtoe (See Figure 7). The industrial sector will remain the largest consumer, followed by residential (29 percent), transport (28 percent) and commercial (3 percent) in 2030 (See Figure A6). Industry will continue to shift from energy intensive industries to non-energy intensive industries, resulting in a decrease in energy intensity.

According to APEC estimates, natural gas demand exceeds demand for oil in the industrial sector in 2030. Coal and electricity will grow at 4.7 percent and 4.4 percent per year respectively, while renewables are only projected to grow at 3 percent per year. The growth in renewables in the industrial sector comes mostly from increased use of biomass in cogeneration.

The transport sector is expected to experience an annual growth rate of 3.9 percent with most of the incremental growth from the road transport subsector. The transport forecast incorporates phasing in of LPG and CNG vehicles and buses but does not include the significant development of biofuels planned by the Government. The GOI has set a 10 percent penetration target for biofuels by 2010 and expects this will require \$22 billion in investment.

For the residential sector, growth in population and growth in income are the most important variables in predicting average growth in energy demand. Average annual growth is expected to drop from 2.1 percent over the past two decades to 1.1 percent over the next two decades. Switching from non-commercial to commercial fuels explains the projected slowdown of growth in residential energy demand. Despite fuel switching, biomass fuels will remain the largest share of total residential energy demand at 72 percent in 2030. Kerosene demand will decline at 0.4 percent, reflecting declining use of kerosene for lighting. Electricity will grow from 6 percent to 13 percent of residential demand as overall electrification will increase from 58 percent of the population in 2004 to 95 percent in 2030.

## **4.3 10HPOLICIES AND INSTITUTIONAL FRAMEWORK**

The energy sector in Indonesia is dominated by key policies and objectives related to the following:

- *Diversification*: A key objective of the GOI is to reduce dependence on oil by expanding the use of coal, gas, and renewable energy sources. Specific targets are set for each energy source in 2025.
- *Rational Energy Pricing*: The GOI recognizes that it can no longer sustain uniform pricing for electricity and petroleum products across the country, and has begun to scale back fuel subsidies.
- *Energy Conservation*: As an impact of increased crude oil price since 2005, the GOI is increasingly promoting energy efficiency measures in both the public and private sectors.
- *Energy Sector Reform*: The combination of decentralization of government decision making and the need to attract capital for investment in the energy sector makes energy sector reform – including greater transparency in planning and decision-making – a critical priority for the government.
- *Rural electrification*: The GOI wants to bring electricity to 90 percent of the population by 2020.

The oil and electricity price subsidy has hampered other energy programs and remains a major barrier for energy diversification and conservation. The relatively low prices of oil and electricity have been major barriers to the success of energy conservation campaigns and programs to encourage fuel shifting.

Since 2007, Indonesia has been an oil-importing country. As a result, the government funding of the fuel subsidy in the annual state budget has increased significantly.

To reduce the burden of energy subsidies in the state budget, the GOI has adjusted the domestic fuel price twice between October 2007 and August 2008 for the industry, transportation, and households sectors. The subsidy is, however, still applied on a limited basis for the residential and transportation sectors. Improved targeting of the subsidy is under discussion, perhaps through provision of public transportation and distribution of vouchers to qualified low-income consumers.

Elimination of the oil and electricity subsidy will open the opportunity for developing other types of energy. Unsubsidized oil prices and electricity tariffs will help encourage industry, households, and businesses to practice energy conservation. Renewable energy options, which have so far had difficulty penetrating the market because they cannot compete with subsidized oil prices, will become least-cost options in many locations. PLN is interested in exploring alternatives to diesel fuel as they have quotas for subsidized fuel. PLN buys diesel fuel at commercial prices for diesel fuel consumption in excess of the quotas.

In another effort to reduce the burden of subsidy, GOI has also introduced a kerosene-to-LPG conversion program for households. Household kerosene stoves can be exchanged at no cost with a LPG stove. To support the program, LPG is made available in a 3kg size to match the buying capacity of small households, while kerosene is gradually retracted from the market in the area where the program is implemented. However, this program has not been without problems. Because of the high prices of gas, many villagers have started using wood again for cooking purposes.

#### **4.3.1 11LIBERALIZATION AND RESTRUCTURING OF THE ENERGY SECTOR**

With the liberalization of the energy sector, the GOI has given MEMR greater responsibility for oversight of the oil and electricity markets. At the same time, there is greater emphasis on transparency and decentralization, as regional governments have assumed increased authority to manage energy resources in their respective regions.

PLN's financial viability has been severely damaged by the economic crisis and the freeze of electricity tariff since 2003. Government Regulation No. 23 of 1994 had effectively corporatized PLN, making it a profit oriented public utility. The enabling law effecting PLN's corporatization (Law No. 20/2002), however was annulled by the Constitutional Court. Currently, the Government is drafting a new law wherein PLN will operate commercially and be financially independent of the government. There is no indication when, or if, this law might be passed. Development goals like rural electrification will be continued by the Government, which will provide transparent subsidies to poor regions and customers from a national electrification fund.

Until recently, PLN centrally managed the national electricity system planning, development, and management. This state-owned utility company holds a monopoly for the power generation, transmission, and distribution, as well as power retailing. PLN is currently unable to expand its power-generating capacity due to financial difficulties.

#### **Key Policies and Legislation**

A guiding principle of national energy management is now referred to as Law No.30/2007 on Energy. This Law does not override any existing energy-related laws, particularly those regulating energy resources such as oil and gas, electricity, geothermal, and nuclear.

Under Law No. 30/2007 on Energy, the National Energy Council, chaired by the President, was established to replace the National Energy Coordinating Board (Bakoren), which was chaired by the Minister of Energy and Mineral Resources. The Council includes representatives from stakeholders including academics, and members of the private sector, professional associations, and consumer groups.

Prior to the enactment of Law on Energy, the President issued Presidential Regulation (Perpres) No. 5/2006 on National Energy Policy (Kebijakan Energi Nasional or KEN) as a basis for energy sector development. It set national targets for the optimal energy mix in 2025, i.e.: (i) less than 20 percent from oil; (ii) more than 30 percent from gas; (iii) more than 33 percent from coal; (iv) more than 5 percent from biofuel; (v) more than 5 percent from geothermal; (vi) more than 5 percent from other renewable sources, especially biomass, nuclear, microhydro, solar and wind; and (vi) more than 2 percent from liquefied coal. In addition, a national target was established to reduce energy elasticity to less than 1.

In the same year, a Presidential Instruction (Inpres) No. 1/2006 was issued for biofuel development. The roadmap for biofuel was prepared to promote development of pro-growth, pro-poor, and pro-job biofuel projects in Indonesia. The Government seeks to use investment in biofuel projects to provide a sustainable source of energy supply while at the same time helping to alleviate poverty and supporting national development. The Energy Blueprint issued by the MEMR is a strategy document to guide the development of energy in Indonesia. The Blueprint includes a number of programs including phasing out subsidies in the energy sector, introduction of new incentives, and introduction of a carbon tax. The Blueprint also includes



roadmaps for energy development including solar, geothermal, and nuclear. It has become the basis for several laws enacted for the energy sector, including the National Energy Policy Law of 2006.

Table A3 lists the existing law, decrees, regulations, and policies in Indonesia which have a major influence on the development of the energy sector.

#### **4.3.1.1 ELECTRICITY LAW**

The establishment of a liberalized electricity market with multiple buyers and sellers was mandated in Law No. 20/2002, which was annulled on December 15, 2004 by the Constitutional Court. The Court asserted the authority of the former Electricity Law No. 15/1985, thus returning the electricity sector to a monopoly with centralized control.

Under the current framework, generators who wish to sell power to PLN are governed by the following regulations:

- Ministry Regulation No. 1122K/30/MEM/2002 on Scattered-Small Power Generation Using Renewable Energy
- Ministry Regulation No. 010/2005 on Procedures for Electric Power Business Licenses for Inter-Provinces, Regions, or for National Grid Connections
- Ministry Regulation No. 002/2006 on Medium-Scale Power Generation from Renewable Energy Sources
- Ministry Regulation No. 1213K/31/MEM/2005 on National Electricity General Plan (RUKN)
- Ministry Regulation No. 2059K/31/MEM/2005 on Establishment of PLN's Power Supply Plan for 2006-2015
- Ministry Regulation No. 14/2008 on Standard Selling Price from Electricity from Geothermal Power Plant
- Ministry Regulation No. 269-12/26/600.3/2008 on Electricity Production Cost from PT PLN

All these regulations play an important role in determining the business environment for private project projects. They outline the arrangement on pricing and contract length for different renewable energy sources of different sizes, sources, and regions. For example, Ministry Regulation No. 002/2006 defines contractual options of 10 years for PLN and RE developers with periodic price adjustment. The price adjustment is based on PLN's regional production cost, which is largely derived from a fossil fuel power plant, as outlined in the recent Ministry Regulation No. 269-12/26/600.3/2008.

These policies demonstrate the GOI's desire to increase the contribution of electricity from RE. In spite of improvements to enable more RE project development, price-setting continues to constrain development of RE projects.

#### **4.3.2 12HENERGY EFFICIENCY AND DEMAND-SIDE MANAGEMENT**

Although hampered by subsidized energy prices that make investments in energy efficiency unattractive, Indonesia has undertaken several demand-side management programs with some success. In the last three years, the President has issued two instructions (No.10/2005 and 2/2008) to all government agencies to implement energy efficiency measures. The level of success of the policy varies by agency. The instructions do not seem to create sustainability of energy efficiency practices.

Households are encouraged to save energy mainly through electricity saving. PLN is implementing a sizeable campaign to reduce demand during peak hours (5 to 10 p.m.). This program is purely voluntary and does not include any incentives and/or penalties.

Since 2005, an incentives scheme has been applied to large commercial and industrial customers. If energy savings of at least 50 percent of peak consumption are not achieved, the kWh unit price of electricity is quadrupled to the uniform electricity tariff (TDL).

Other measures which have been undertaken to promote energy efficiency include:

- Establishment of testing labs within PLN, MEMR, BPPT, MOE and IT Bandung
- Broad introduction of CFLs by PLN
- Free energy audits for large industrial consumers
- Testing of automobiles by the MOE

All national industrial standards (Standar Nasional Indonesia or SNI) related to energy efficiency are voluntary, which undermines adherence to the standards. Most existing standards relate to energy conservation in buildings. There are no standards for energy consumption in the industrial sector.

MEMR has initiated a labeling program for household electronic appliances based on the European Community program. More specific technical guidance still needs to be developed to enable mandatory application of this program.

Investments in credible testing labs are required for labeling and standards programs to be effective. Several testing labs have been set up in Indonesia, such as PLN's subsidiary PT PLN Electric Power Technical Services for testing CFLs and ballasts. The Institute of Technology at Bandung (IT Bandung) has equipment to measure the efficiency of refrigerators, air conditioners and water pumps. The Ministry of Environment has set up a testing lab for measuring the performance and emissions of automobiles as part of its Mandatory Disclosure of Automotive Emissions (MDOAE) program.

The DGEEU has a program that provides free energy audits for the industry through PT Koneba. (See more discussion on PT Koneba later in this report.) BPPT has also carried out audits in the cement, pulp and paper, iron and steel, and fertilizer sectors that quantified costs, expected energy savings, and CO<sub>2</sub> emissions reduction for recommended actions. The program identifies three categories of opportunities: no cost, low cost, and requiring investment. Only a few industries have taken action to reduce their energy consumption. Even no-cost measures may not be implemented because companies lack energy managers and appear unwilling to invest their own funds on these unproved efficiency upgrades. (See Table A4: Energy Conservation and Efficiency Decrees, Regulations, and Policies in Indonesia.)

#### **4.3.3 13HRENEWABLE ENERGY POLICIES**

To encourage development and utilization of RE and to improve efficiency of energy utilization, a "Policy on Renewable Energy and Energy Conservation" – also called the "Green Energy Policy" – was promulgated by the Ministry of Energy and Natural Resources on December 23, 2003. This policy provides the reference for RE development and energy conservation in Indonesia to support sustainable development.

Under the Green Energy Policy, renewable energy in Indonesia has been classified into three types: (a) already developed commercially (biomass, geothermal, and hydro energy); (b) already developed but still limited (solar, wind); and (c) still at the research stage (ocean energy).

The Green Energy Policy defines action steps consisting of formulation of more specific policies and programs. These include policies for: (a) investment and funding; (b) incentives; (c) energy pricing; (d) human resources; (e) information dissemination; (f) standardization and certification; (g) research and development; and (i) institutional development.

Following the Green Energy Policy, the Blueprint on Energy published by MEMR (as mentioned above) set forth a roadmap for development of different energy resources, described strategies for incentives such as a carbon tax, and provided an overview of available and potential resources and target energy mix. This document was the basis for Presidential Regulation on National Energy Policy in 2006. (Table A5)

#### **4.3.3.1 DISTRIBUTED SMALL SCALE POWER GENERATION (PSK TERSEBAR)**

In June 2002, MEMR issued a new regulation for small renewable energy projects interested in selling power to PLN known as PSK Tersebar (Ministerial Decree on Small-Scale Power Purchase Agreement – MD No.1122/K/30/MEM/2002). The regulation requires PLN to purchase electricity generated from RE sources by non-PLN producers for projects of up to 1 MW capacity. Institutions eligible to participate are cooperatives, private companies, and government-owned companies. Purchase tariffs will be calculated at 80 percent for medium voltage and 60 percent for low voltage of PLN's announced "Electricity Base Price," which is supposed to be its marginal production cost at the location where the plant is to be built. Despite the clear potential of this standard pricing mechanism, only a handful of hydro facilities, most of them very small (10-100 kW), have been constructed, since PLN prefers to negotiate a low long-term price rather than apply the PSK decree in setting the price.

The first project was completed in December 2003 with PLMTH Kalimaron, a community-based organization in Seloliman, East Java, which owns a 25 kW micro-hydro power plant. PLN agreed to buy its excess generation of 12 kW. This provided extra earnings of IDR 3,000,000 (approximately US \$300) per month. Table A6 shows the other plants operating under PSK Tersebar as of September 2005.

Despite the regulation, it remains challenging to negotiate agreements. Although the number of projects participating in the program has increased, the extendable one-year contracts make it difficult to obtain financing from financial institutions. Program growth is also constrained by the lack of clarity on how to calculate the tariff and the need to negotiate each deal with the local PLN office where the project will be located. Progress has been made in this area since benchmark tariffs have been introduced under Ministerial Decree No 269-2008 on the cost of power production by area subsystem.

In January 2006, MEMR issued Ministerial Decree No. 002/2006 on Medium-Scale Power Generation from Renewable Energy Sources that applies the same price guidelines for projects from 1 MW to 10 MW and sets a minimum contract period of ten years.

## **4.4 14HINSTITUTIONAL FRAMEWORK**

The following section discusses Indonesia's energy institutional framework.

#### 4.4.1 15HGOVERNMENT

*MEMR (Ministry of Energy and Mineral Resources, formerly MME):* The main regulatory agency for energy. It is responsible for preparing analyses and recommendations for energy sector issues, supervising state-owned utilities and energy service companies, and conducting energy research and testing. The Ministry is in continuous consultation for new strategies and implementation of energy policies with a commission in the Parliament.

*Ministry of Finance:* The Ministry of Finance has begun to play a more active role in responding to climate change issues, both domestically and internationally. MoF leads an inter-ministerial working group that developed analyses and capacity on climate change and low carbon issues. It is leading GOI collaboration with the World Bank on the development of a “Low Carbon Development Options” study that will evaluate and develop strategic options to address climate change mitigation issues without compromising development objectives. The MOF has initiated the establishment of an Indonesia Clean Technology Fund, a \$US250 million equity enhancement fund for clean technology projects in Indonesia and the MOF will take be the lead Ministry in Indonesia that prepares project proposals for consideration by the World Bank’s Clean Technology Fund.

*DGEEU (Directorate General for Electricity and Energy Utilization of the MEMR):* The particular unit within MEMR in the field of electricity and renewable energies and energy conservation. DGEEU also chairs the Rural Electrification Steering Committee which is responsible of ensuring inter-agency coordination and cooperation in matters related to the government's rural electrification program. In addition, DGEEU co-ordinates and supports SPPA (Small Power Purchase Agreement) project developments.

*DG MIGAS (Directorate General for Oil and Gas of the MEMR):* The unit within MEMR responsible for oil and gas exploration and production. The green movement within the oil and gas sector is now taking hold in Indonesia, and this unit is developing a Green Oil and Gas Initiative to promote cleaner production in terms of less flaring, less discharge, and cleaner air. The unit is also in the process of developing a blueprint for emission reduction for the oil and gas industry.

*BAPPENAS (National Development Planning Agency – Bureau for Electricity, Energy Development and Mining):* Prioritizes renewable energy projects, special rural electrification projects, determines level of government support, and appoints Government project partners. BAPPENAS is the agency responsible for preparing long- and medium-term (five-year) national development plans.

*DEN (Dewan Energi Nasional/National Energy Council):* the Council is mandated to prepare the National Energy Policy with approval from the House of Parliament, to formulate the National Energy Master Plan, and to lead responses to energy crises and emergency situations.

*MPW (Ministry of Public Works):* responsible for hydro power resource surveys and, in a few cases, the operation of hydro plants and building codes.

*MOC (Ministry of Cooperatives and Small Enterprises Development):* responsible for enhancing the role of co-operatives in rural electrification, and in some cases initiator of electrification projects. A description of the business activities of these co-operatives is provided in the “Cooperatives Section” of this report).

*BPPT (BPP Teknologi)*: this is the Agency for the Assessment and Application of Technology, established in 1978. BPPT reports directly to the Indonesian President. It is responsible for technology research and development, demonstration, testing etc., and is involved in project development in the pilot and pre-commercial phase.

*Executive Agency for Upstream Oil and Gas Activity (BPMIGAS)*: This Agency is set to replace Pertamina as regulator and manager for oil and gas contractors. It appoints a company to act as an agent selling the Government's portion of crude oil and gas. The agent is usually the oil and gas contractor that has the production sharing contract (PSC) with BPMIGAS in the corresponding oil/gas block.

*Coordinating Ministry of Economic Affairs (Menko Perekonomian)*: This Ministry's main role is to coordinate and synchronize the preparation and formulation of policies in economic affairs and integration of policies, plans, programs of all line Ministries. Its current mandate includes overseeing the utilization of biofuels and reporting results to the president together with an independent team for acceleration of the biofuel program.

*National Standards Bureau (BSN)*: the national authority that sets standards for end-use appliances such as compact fluorescent lamps (CFLs), refrigerators, air conditioners, and small motors.

*AFRD (Indonesian Agency for Forestry Research and Development)*: This Agency is linked with the Ministry of Forestry (MFO) and undertakes research and studies on the utilization of wood and biomass.

*National Commission for Clean Development Mechanism – NC-CDM (Komisi Nasional Mekanisme Pembangunan Bersih)*: The Designated National Authority for Clean Development under the United Nations Framework Convention on Climate Change (UNFCCC) is the Komisi Nasional Mekanisme Pembangunan Bersih, or NC-CDM. Nine government agencies are represented on the NC-CDM: Environment, Energy and Mineral Resources, Forestry, Industry, Foreign Affairs, Home Affairs, Transportation, Agriculture, and National Development Planning Agency. The NC-CDM is aided by a secretariat, based in the Ministry of Environment, responsible for administrative details and facilitating the evaluation process of the submitted project proposals. A technical team evaluates project proposals by using sustainable development criteria and inputs from the Expert Group and other Stakeholders. Compared to other countries in the region, the NC-CDM got off to a rather slow start (See the Gap Analysis Section for more discussion of this), but has ramped up its processing of projects over the past two years.

*National Council of Climate Change (DNPI)*: The creation of the National Council of Climate Change, a very recent development, was formed by Presidential Decree in July 2008. DNPI will be chaired by the President and involve 17 Government ministries including the State Secretary, Cabinet Secretary, and the Ministers of Finance, Home Affairs, Foreign Affairs, Energy and Mineral Resources, Forestry, Agriculture, Industry, Public Works, National Development Planning, Marine and Fisheries, Trade, Research and Technology, Transportation, and Health. The DNPI will work to implement the National Action Plan on Climate Change adopted in November 2007 through working groups on adaptation, mitigation, technology transfer, financing, post-Kyoto 2012, and forestry and land use change. The tasks of this new high-level

organization are to formulate national policy, strategy, programs, and activities related to climate change and to coordinate activities related to implementation of climate change, including adaptation, mitigation, technology transfer, financing, and trading. In introducing the new Cabinet-level Council, the Environment Minister expressed hopes that the Council would oversee both public and private sector development plans to prevent the country from becoming a major producer of GHG emissions.

#### 4.4.2 16UTILITIES

PLN has the obligation and the right to supply power in Indonesia. It has become involved in clean energy investments as part of its efforts to manage excessive peak demand growth. In 2002, PLN established a DSM working group and released an ambitious Integrated Resource Plan action plan calling for peak shaving programs, CFL programs, and mobilizing “Captive Power” potential. Over the past five years, PLN has been very successful in scaling up importation and sales of CFL lamps via its Terang and Peduli programs. PLN’s Terang program provided some \$20 million in funding for replacing incandescent lighting fixtures with CFLs, while the Peduli program provided another \$60 million of funding beginning in 2006. The result was that CFL importation rose from less than 10 million in 2001 to more than 70 million in 2007. PLN has also supported the GOI’s “alliance on energy conservation” program by sponsoring energy audits for industrial and commercial customers, and supported the development of energy efficiency labels for major household appliances (e.g., refrigerators, air conditioners, fans, and water pumps).

**Figure 9: Average electricity tariff for Asian countries (source ADB, 2006)**

	Access Ratio (%)	Average Household Electricity Tariff (US cent/kWh)	Average Industrial Electricity Tariff (US cent/kWh)
Cambodia	17	9 - 15	12 - 15
China	99	5 - 8	5 - 9
Indonesia	55	7	5
Lao PDR	41	4	5
Mongolia	90	5	5
Philippines	79	11	10
Thailand	84	6	6
Vietnam	81	5	5

PLN’s commercial operations are severely constrained by the non-cost reflective electricity tariff. Figure 9 shows the average electricity tariff in Indonesia as compared to other neighboring countries. The geography and energy resources of Indonesia are comparable to the Philippines whose tariff is almost 2x as high.

Figure 10 show that in 2007 PLN’s fuel costs alone exceeded its revenues. Although efficiency improvements could improve PLN’s balance sheets, figure 11 shows that the reported transmission and distribution losses are quite low compared to many developing country systems. The electricity tariffs are de-capitalizing the systems at a time when significant investments are needed to expand generation, improve system performance, and expand services to unserved populations. Figure 12 shows PLN’s annual projected investment needs through 2018. Although PLN has successfully attracted a combination of buyer credit facilities, international financing, and local financing for the coal-fired construction program, it has reached its legislative determined debt limit. In January and April 2008, PLN signed a total of seven IDR (Indonesian rupiah) credit facilities totaling \$1.7 billion to develop new coal-fired steam power plants.

Figure 10: PLN's fuel and production costs compared to sales. (Source: PLN)

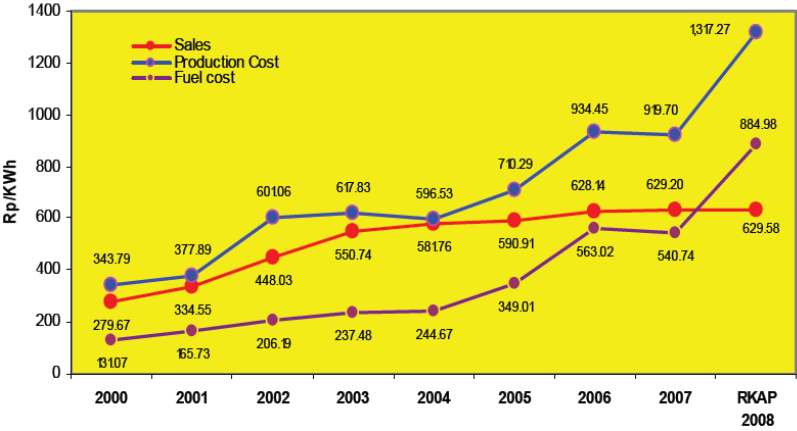
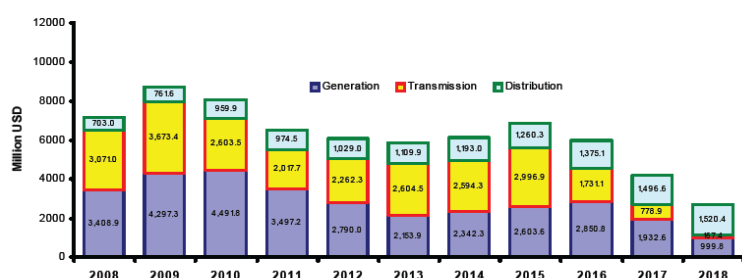


Figure 11: PLN's transmission and distribution losses (source: PLN)

Item	2001	2002	2003	2004	2005	2006
Generation Own-Use (%)	4.19	4.20	4.35	5.72	5.01	4.09
Transmission Losses (%)	2.38	2.59	2.46	2.33	2.27	2.26
Distribution Losses (%)	11.14	13.87	14.41	8.96	9.28	9.18
Total Losses (%)	13.52	16.45	16.88	11.29	11.54	11.45
SAIDI (hours/customer/year)	13.24	14.35	10.90	9.47	15.77	27.02
SAIFI (times/customer/year)	15.12	14.17	12.51	13.96	12.68	13.85

Figure 12: PLN's projected investment needs (source: PLN)



Until 2018, total investment for electricity needed is around 68.3 Billion USD:

- 31.4 Billion USD for Generation
- 24.5 Billion USD for Transmission
- 12.4 Billion USD for Distribution

*PERTAMINA* is the national company responsible for exploiting oil, gas and geothermal energy.

*PT. Bukit Asam* is a national company responsible for exploiting coal resources.

*PGN (Perusahaan Gas Negara)* is a state-owned company responsible for the gas distribution network and gas supply.

*PT Koneba* was established in 1987 as an energy management consultancy with financial support from the World Bank. It is a key provider of energy efficiency services, including free industrial energy audits, energy efficiency project investment, and energy management services



managed by DGEEU and MEMR. PT Koneba has been renamed to PT Energy Management Indonesia (Persero). The company was intended to perform as Energy Service Company (simultaneous technical and financial services), but the ESCO market has not developed as planned because of the low uniform electricity tariff.

*Cooperatives:* The MOC initiates village-based cooperatives (Koperasi Unit Desa or KUDs) with multiple purposes, including the electricity sector. The business activities of these cooperatives related to electricity have been conducted under four specific schemes (called “Pola”) and two Management Service Arrangements (MSAs).

#### **4.4.2.1 NON-GOVERNMENTAL ORGANIZATIONS (NGOS)**

NGOs play a number of important roles in Indonesia’s energy sector, including as advisers, project developers, and managers of energy programs. NGOs are also active in the different RE fields. The most active ones are:

- The Renewable Energy Network Indonesia (RENI) was established as a program of the NGO Yayasan Bina Usaha Lingkungan (YBUL), with the support of USAID. It aims to stimulate the development and implementation of renewable energy in Indonesia. RENI identifies possible projects, is active in cost-sharing of pre-investment studies, and transfers technologies for renewable energy.
- IBEKA is focused on the development of micro hydro projects.
- PELANGI is an NGO offering general consulting services for renewable energy project development.
- Yayasan Dian Desa is involved in an improved stoves program.
- Indonesian Institute for Energy Economics (IIEE) is an NGO providing consulting services on energy economics.
- Institute for Essential Services Reform is a group of NGOs advocating power sector reform.
- WWF Indonesia is an NGO that promotes renewable energy and democratization in the electricity sector.
- Indonesian Center for Environmental Law is an NGO advocating recognition of community rights in respect to the environment and natural resources.

#### **4.4.2.2 PRIVATE SECTOR**

The private sector operates significant amounts of captive power capacity and plays an important role in the supply of oil, gas, and electricity. In the electricity sector, more than 50 percent of the additional grid capacity (around 11,600 MW) was estimated to come from IPPs in 2004. To date, power purchase agreements have been signed with IPPs for over 3,700 MW; negotiations have been completed for projects with a total capacity of over 1,000 MW. In terms of renewable energy utilization for rural electrification, the future role of the private sector will basically concentrate on the SPPA concept. A more detailed discussion of the SPPA concept and IPPs can be found in the “Barriers” section of this report.

## 4.5 17HDONOR ENGAGEMENT

### 4.5.1 18HWORLD BANK

The World Bank has been supporting clean energy and clean development in Indonesia since the mid-1990s. One of the first World Bank-executed RE projects was the Indonesia Solar Home Program, an ambitious and path-breaking effort to provide household solar PV systems for 200,000 Indonesian homes. Originally budgeted at \$120 million, this project did not fully expend its funding but was instrumental in establishing an early solar energy industry focused on rural applications.

The World Bank further assisted the GOI to identify the key barriers that prevent the expansion of electricity and propose potential solutions to speed up access. The analysis and recommendations are consolidated in the report "Electricity for All: Options for Increasing Access in Indonesia" published in 2005 (See Annex 2). Based on this study, in 2008 the World Bank is designing the Electricity Access for Rural Transformation Project, a project loan of about \$150 million to LEC for grid expansion in rural areas. The World Bank is actively seeking partners to focus on developing rural generation sources to complement this activity.

World Bank support to geothermal is substantial, and includes three pillars:

In cooperation with MEMR, a \$4 million Global Environment Facility (GEF) project to develop policy support of geothermal scaling-up;

Mobilizing carbon finance for geothermal projects and programs (a one-off project at Lahendong in Sulawesi has already been done); the World Bank is now developing a programmatic CDM approach via a project focused on private sector developers; and

Responding to a request by Pertamina for assistance in developing a geothermal development plan.

At the policy level, the World Bank is considering a \$100 million development program loan focusing on climate change. In addition to this, the Bank is also drafting a paper on low carbon strategies with the Ministry of Finance and Energy.

World Bank in collaboration with the GOI is conducting a "Low Carbon Development Options" study that will evaluate and develop strategic options to address climate change mitigation issues without compromising development objectives.

Through its carbon offset program, the Bank has supported several projects that promote cleaner energy, such as utilization of municipal solid waste for electricity generation in Makassar, Bekasi, and Pontianak and also biomass utilization in Indocement plants.

The World Bank has also provided an investment loan to PGN and PLN for two projects for domestic gas market development and Java-Bali power sector restructuring.

The World Bank assistance in preparing and executing rural electrification and renewable energy projects has been characterized by the lack of effective public sector counterparts:

- Since the financial crisis of 1999-2000, and especially after the last electricity tariff increase in 2003, PLN has been making fewer new customer connections. Although PLN has a dual role of being a profit oriented utility company and a provider of public electricity services, the

financial discipline enforced by the State Ministry of State-Owned Enterprises as the shareholder's proxy during the difficult financial situation has made PLN more reluctant to connect new residential customers in rural areas, as the marginal cost of serving them is less than the marginal revenue received. Projects prepared and recommended at the staff level frequently do not receive strong support at the shareholder level.

- MEMR provides state budget support for the rural electrification project, and the World Bank had designed a rural electrification loan to MEMR which was to be on-lent to sub national governments. MEMR was unable to execute this plan and the World Bank cancelled this loan and will replace it with a direct loan to PLN.

#### **4.5.2 19HJAPAN INTERNATIONAL COOPERATION AGENCY**

JICA has supported the GOI in its clean energy development via several important projects. These include a recent effort to develop a National Geothermal Power Development Plan for Indonesia. Completed late last year, the study aims to integrate Geothermal Power Development within the overall Power Development Plan. The study will also consider the CDM potential of developing the geothermal sector, which will hopefully promote investment in the geothermal power sector. Other energy-related JICA activities include a study on Optimal Electric Power Development in Sulawesi and a Study on the Improvement of Utilization of Electric Power Facilities in the Java Bali Region.

JICA is also supporting the Ministry of Finance to develop technical studies and a research program in support of climate change and low carbon issues for the MoF inter-ministerial working group.

#### **4.5.3 20HASIAN DEVELOPMENT BANK**

The ADB is active in a range of projects, from upstream gas field development to off-grid rural electrification using renewable energy. A project initiated in 2002 provided over \$150 million in lending for connecting about 76,000 new consumers to the power grid, including providing 10,000 low-income families in Indonesia's outer islands with solar home systems and hydro-based mini-grids. The project comprises 12 sub-projects that will add a total of 82 megawatts of capacity in five remote regions of the outer islands. It will also strengthen associated power distribution networks. The project's implementation, however, faces many obstacles in acquiring land use permits, and especially in complying with the ADB's social safeguard standard. The ADB's standard for land acquisition and resettlement is higher than PLN's common practice. This has prolonged the project's implementation and the volatile construction market of the last three years has made the projects even less attractive for PLN.

Since 2005, the ADB, together with PLN, have also prepared an energy efficiency project, a combination of distribution network improvement and DSM projects totaling about \$250 million. Project preparation and approval, however, have been hindered by lack of coordination between PLN, MEMR, and BAPPENAS. As a Government agency responsible for coordinating public sector loans, it appears that BAPPENAS believes that financing rural electrification projects, which is dominated by local currency expenditures, is best conducted through local financing (i.e. state budget or PLN's own budget) rather than dollar financing from donor(s).

#### **4.5.4 21HDANISH INTERNATIONAL DEVELOPMENT AGENCY (DANIDA)**

Denmark has embarked on strong bilateral cooperation in developing CDM projects beginning with the January 2005 MOU between Denmark and the Indonesian Government. The emphasis so far has been on waste management including waste-to-energy projects and palm oil effluent. A new five-year commitment from DANIDA on the Environmental Support Programme is being implemented in 2008 for a value of DKK 180 million. Two of the three components in the program address clean energy issues. The first one will support MEMR in promoting energy efficiency in the public, industrial and commercial sectors, and the second will be a contribution to the World Bank programme, such as promotion of small hydro power plants in northern Sumatera.

The earlier CDM project was a success in raising the awareness of the selected industrial sector CDM opportunities. In the programme, DANIDA provided assistance for interested industries to start writing Project Design Documents (PDDs) as a tool for DANIDA to justify further support for developing CDM project of their interest. However, only one emission reduction purchase agreement was concluded during the initial period of this support.

#### **4.5.5 22HAUSTRALIA**

CSIRO and ANU are working on a study of pathways to sustainability in partnership with BAPPENAS. This work will produce results on carbon intensity and employment absorption of industrial sectors; a CGE model that can be used to look at regional impacts of energy reform scenarios; and region-specific information that can be used to understand the impacts of macro policy change on land and resource use at the local level.

#### **4.5.6 23HTHE EC-ASEAN ENERGY FACILITY (EAEF)**

The EAEF is a program of cooperation between the EC and ASEAN to facilitate partnerships between ASEAN and European organizations in developing specific joint regional projects in the energy sectors. The programs that were implemented in Indonesia before termination of the EAEF in 2007 were:

- 10 MW Riau Palm Oil Residue Power Project
- Implementation of CDM in the ASEAN Energy Sector
- Rice Husk Plants Feasibility Assessment (Indonesia, Philippines, Vietnam)
- Feasibility Assessment for Wind Energy Development
- Pan-regional Prospects for Vehicular Fuel Ethanol for Sugar-based Feedstocks
- 4.2 MW Rice Husk-fuelled Power Plant in North Sulawesi

The most obvious benefit of this program is a broader networking and exchange of skills and technology between EC and ASEAN organizations. Many of the supported projects are small-scale and limited to implementing a pilot project and completing a background study to inform policy makers. While this is effective in stimulating cooperation, it does greatly impact the implementation of renewable energy projects.

#### **4.5.7 24HINTERNATIONAL FINANCE CORPORATION**

The IFC has shown increasing interest in financing and providing advisory services to climate change initiatives, clean energy development, and energy efficiency options. Very recently, it tendered out a detailed scoping study for “Indonesia Sustainable Energy Finance Program,” which will be implemented by the successful bidder in Q4 of 2008. Two sectors have retained IFC’s particular interest: (1) the food and beverage industry and the (2) palm oil industry.

The IFC has also been assisting the Government and PLN in operationalizing the public-private partnership (PPP) framework through the preparation and execution of Central Java IPP in 2008 and 2009. The new IPP is expected to serve as a model for future IPP projects as project structure and availability of government support is made in accordance with the new PPP regulation.

## 5 25HGAP ANALYSIS

Key barriers to the development of renewable energy and other clean energy initiatives in Indonesia cut across a number of areas:

### 5.1.1 26HPOLICY AND REGULATION

- *Oil price subsidy.* The Government's political decision to retain the oil price subsidy has hampered other energy programs and remains a major barrier for energy diversification and conservation. The relatively low prices of oil and electricity have been major barriers to energy conservation campaigns over decades.
- *Uneconomical nation-wide electricity tariff.* The Government's political decision to hold electricity tariffs constant since July 2003 and to apply a nation-wide uniform electricity tariff (TDL) continue to mask the true cost of supplying electricity to consumers, and make the sector non-bankable. These policies also hamper the expansion of electricity production capacity and make the sector inefficient, as there is no price signal for investors indicating lack of supply opportunity or for consumers to conserve the use of energy. Institution of cost-recovery tariffs is vital for the GOI to be able to meet its target of 90 percent electrification by 2020. With the highly sensitive nature of the electricity pricing the Government will need to exhibit political will to rationalize its tariffs and better target remaining subsidies.
- *Lack of policy/regulatory coordination.* The "Energy for All" World Bank study (See Annex 2) has reported that there are many players in the country working on various rural electrifications programs with competing government departments, varying procedures, and diverse financing sources. Unfortunately, there is no effective coordination among the different players. There is also legal and regulatory ambiguity surrounding the responsibility for rural electrification. It is unclear whether the responsibility for rural electrification is given to the MEMR Social Electrification Unit or to the PLN. As a result PLN disbanded their Rural Electrification Unit and the electrification program slowed as a result (See Figure 15 on rural connection growth).
- *Lack of policy/regulatory enforcement.* Lack of enforcement in environmental regulation is observed in the implementation of PLN's 10,000 MW fast-track program. PLN selected winners from the initial tenders for 10,000 MW of new coal-fired power plants to be built over the next three years that did not comply with national standards. In particular, NO<sub>x</sub> standards require less than 750 ppm but the accepted bids only proposed 1,200 ppm. Similarly, the Government has initiated the establishment of an energy efficiency standard, but in its implementation, lack of enforcement mechanisms has hindered its widespread application both at the industrial and consumer level.
- *Lack of priority in energy utilization.* Although Indonesia is the world's sixth largest natural gas producer and supplies about a quarter of the world's liquefied natural gas from its fields in Aceh and Kalimantan, until recently the abundance of cheap oil limited the domestic utilization of clean natural gas. Several recent developments have set the stage for natural gas to play a much more important role. First, Indonesia has been on the verge of becoming a net oil importer since 2004. Second, the trend of increasing oil prices has made natural gas

competitive. As a result, PLN is keen to substantially increase the share of natural gas in its generation mix; however, long-term LNG export supply contracts and lack of new domestic commercial production capacity have denied PLN the benefit of clean energy from natural gas.

- *Lack of fiscal incentives for new technology and renewable energy utilization.* There was no fiscal incentive provided for the utilization of new energy technology and RE in Indonesia. The duties, taxes, and other fees that are ordinarily payable on imported goods (customs duties of about 10 percent, VAT of about 10 percent, and import income tax of 2.5 percent of the import value) are applicable to new technology and RE as well. In 2006, the MOF issued a regulation exempting import duty on capital goods purchased by IPPs entering into PPA contracts with PLN. However, the promulgation of a new Customs and Excise Law later in the same year has effectively nullified this tax exempt regulation.

### 5.1.2 27HTECHNICAL AND ECONOMICAL ASPECT

- *Lack of transmission capacity.* Power systems in Indonesian islands are characterized by lack of long-haul interconnecting transmission networks. This is true even for a more advanced system like the Java-Madura-Bali grid, in which big power plants are concentrated in West Java (Suralaya and Cilegon), and East Java (Gresik, Grati, and Paiton), while almost half of the system load is concentrated in the Greater Jakarta and Tangerang area. This has resulted in a daily flow of about 2,500 MW from the east to the west, overloading the main transmission lines. The need to develop long new transmission lines to connect the RE power plants (Java has especially large geothermal energy potential) with the load center has increased the cost of utilizing the RE resources.
- *Low load factor.* The average power system load factor in Indonesia by 2006 is about 64 percent, varying from 34 percent in North Sumatera to about 91 percent in Jambi (eastern part of Sumatera). This low load factor has made it difficult for PLN to expand its base load generation capacity. Since RE energy power plants sourced from run-of-river and geothermal resources are usually more economical to operate as base load generators, outside the Java-Bali system PLN tended to construct diesel power plant for capacity expansion.
- *PPA pricing.* Pricing of electricity for purchase by PLN from private producers has been one of the most significant barriers to renewable energy IPP. PLN was required to purchase electricity-based on a tariff formula that used the nationwide uniform tariff (TDL) as a reference. This regulation has made small and renewable PPA non-bankable, as the price did not truly reflect the cost of supply. New reference prices based on local cost of supply were introduced in 2008 to overcome this problem. Its implementation by PLN regional units is yet to be confirmed.
- *Investment cost for clean coal and renewable technology.* The cost of clean coal technology (e.g. supercritical technology) and renewable energy is greater than the cost of conventional coal technology (e.g. pulverized coal, PC). See table below for estimates. With its retail electricity tariff frozen by the Government since 2003, PLN has not been able to pass-through the cost of developing clean-coal technology to its customers; thus, PLN continues its use of cheaper conventional coal technology. This has been reflected in the implementation of the 10,000 MW fast-track program which ignores clean coal technology.

### Estimates of Heat Rates and Capital Costs of Coal and Renewable Energy Technologies

	Sub critical PC	Supercritical PC	Ultra-supercritical PC	Geothermal	Wind
Average Gross Heat Rate, kJ/kWh (HHV)	9,500-10,200	8,500-9,200	8000-8500	-	-
Capital Cost, USD/kW	800-1,250	900-1,300	1,100-1,400	3,000-4,000	1,900-2,500

Source: IFC, 2008

- *Losses from new customer connection.* Rural electrification is not financially attractive to PLN because Indonesia's off-grid areas are sparsely populated, have very low load factor, and are dominated by low-end household consumers who are charged a heavily subsidized tariff (average revenue for household consumer was about IDR 628/kWh in 2006). Most off-grid (isolated) regions are supplied by diesel power plants that consume high-priced diesel oil. This increases PLN's cost of production far above IDR 2,000/kWh. As the electrification ratio slowly increases, it is getting more difficult for PLN to achieve the additional 1 percent increase, as villages without electricity access tend to be more distant from PLN grids, have less road access, and are more sparsely populated. The more villages get access to electricity, the less financial interest PLN has to provide access to the remaining unconnected villages.

#### 5.1.3 28H INSTITUTIONAL AND STAKEHOLDER'S CAPACITY

- *Lack of institutional capacity.* Both central government and sub-national governments lack the capacity to formulate and effectively implement policies and regulations. Weak political commitment and lack of budget support have diminished the capacity of government institutions and staff to execute policy and enforce regulations. Training need analyses are rarely conducted and no rigorous training plan was available. Effective training programs depend on collaborations with donor institutions, which program for no longer than a two-year period. Lack of consistency in staff selection and career advancement, together with the bureaucratic communication process, weaken institutional memory and eventually hinder a sustainable implementation of government policies.
- *Lack of resources for project development.* Substantial skills, knowledge, and budget support are required to prepare, obtain financing, and implement energy projects. These resources are not readily available to central and sub-national governments and, to some extent, PLN regional units. MEMR established a clearinghouse for renewable energy development, providing knowledge management resources for project development. This has been quite effective in sharing the best practice knowledge with stakeholders at the district level. A similar concept may be applied to establish a project development fund, which could be used to finance feasibility studies and identification of new project opportunities.

#### 5.1.4 29H SECTOR SPECIFIC BARRIERS

- *Geothermal:* The primary barriers to the development of Indonesia's geothermal resources have been the pricing of electricity and a shifting regulatory environment. In general, geothermal projects require more capital to develop than other energy projects. The project developer must invest in drilling to map and evaluate the quality of the resource prior to the capital investment to build the plant. It will be hard for private developers to move forward with



these projects without greater confidence in the long-term pricing of electricity. In addition, Geothermal developers must deal with a variety of different entities (regional governments for licensing, PLN for PPA negotiation) complicated the development process.

- Landfill gas to energy: Current “buy-back rates” for selling electricity generated from landfill gas into the national grid are seen by the private sector as too low to make such an approach commercially viable. As a result all current landfill gas projects in Indonesia are planning to flare the methane only.
- Hydro: Financing for hydro projects will remain a major challenge because of the difficulty in negotiating long-term power purchase agreements with PLN.
- Biomass: Because Indonesian policy requires rice mills to be situated close to where rice is grown, most mills are small and decentralized. The rice husks produced by rice mills have low bulk density and are expensive to transport, so the technical potential from rice residues probably overstates the economically viable potential.
- Gas flaring: Other policy and regulatory barriers that have been identified current regulation only governs the sharing of the production of oil and gas, but there is no policy on how to treat CERs, as this issue is still being addressed by the relevant agencies.

#### **5.1.4.1 CASE HIGHLIGHTS: BARRIERS TO THE DEVELOPMENT OF SMALL AND MEDIUM SIZE RENEWABLE ENERGY IPPS**

While much progress has been made over the last couple of years towards a regulatory framework on power purchase price-setting from renewable sources, a very small number of projects has actually been implemented adhering strictly to these regulation. The main factors and grounds for this limited success are discussed below.

- There is a lack of (political) willingness by PLN to strictly follow the outlined regulations. An example of this is the comments of PLN's energy researcher (previously BOD) Herman Darnel Ibrahim who said that PLN had chosen to reject the national average BPP pricing system because operating conditions and potential reserves differed from region to region. (See Table A6 for benchmark pricing.)
- Non-existence of solid PPA formats under PSK/PSM regulation. Power Purchase Agreements under the PSK/PSM regulations consist of an agreement of a few pages, while a standard PPA for large-scale power generation consists of a few hundred pages. The PSK/PSM regulation was intended to simplify dealings with PLN. A simple agreement does not take into consideration the complexity of establishing long-term financial viability, making the contract an unbankable document.
- Absence of PPAs well-matched to electricity generated from different renewable energy sources. The characteristics of RE sources differ from one to another. Wind and solar energy both have an unpredictable nature and are not “readily dispatchable” and therefore do not add “firm capacity” to grids (as hydro and biomass power generation do). PLN has little or no experience with these non-firm resources and currently, there are no standard PPA formats available matching different RE sources. In the absence of specific and secure PPA's for RE projects from non-firm RE resources, project finance will be hard to obtain.

- While PSK/PSM was designed to reduce production cost at the local level, in fact it increases PLN's cash flow requirements in those areas where production cost/benchmark prices are high. In other than the main grids, electricity is mostly produced by means of diesel generators. Cash flow requirements to keep these facilities running is by and large determined by fuel and routine maintenance expenditures. The PSK/PSM rates however are calculated against benchmark production costs that include amortization and other overheads. As a result, cash requirements to fulfill debt obligations at PLN wilayahs (PLN authority in districts) would potentially increase by integrating independent RE-generating capacity under the PSK/PSM schemes.
- The PSK/PSM purchase rates are indiscriminate towards the source of distributed RE power generation and do not take the actual COE (cost of energy production) into account. The operating cost of RE resources differs from region to region, from technology to technology and from scale to scale. A differential pricing scheme is likely to have a higher acceptance level at PLN; moreover, it would potentially reduce PLN's operational losses more significantly.
- Project development under the PSK/PSM regulation requires MEMR verification. Under the PSK/PSM regulation, developers deal directly with the PLN wilayahs on commercial arrangements. Project developers however need to involve the Jakarta based MEMR for project verification, which unnecessarily creates an additional burden for developers that are not Jakarta-based.

## 6 30HRECOMMENDATIONS

### 6.1 31HSTRATEGIC APPROACH

The recommended interventions focus on opportunities for USAID to utilize its limited funds to support programs which could result in catalytic changes in clean energy development in Indonesia. The activities detailed below are selected to directly address the primary barriers to clean energy development in Indonesia with an emphasis on achieving on-the-ground results. As a result, several of the activities detailed below have established points of resistance within the Indonesian public, PLN, or other stakeholders and achieving success will require a sustained engagement. The proposed interventions have been carefully selected to synergize with the activities of other donors with consideration of USAID's comparative advantage.

#### 6.1.1 32HUSAID'S COMPARATIVE ADVANTAGE

Indonesia benefits from significant donor support for the energy sector. The World Bank, Asian Development Bank, JICA/JBIC, GTZ, DANIDA, and IFC all have active energy sector support programs. USAID re-engagement in the energy sector must be justified both by opportunities for catalytic reform and by a clearly defined comparative advantage to current players in the energy sector. The following factors argue for USAID reengagement in the energy sector:

- History of Energy Sector Support – Before ending its energy sector support activities in 2004, USAID had been engaged in the energy sector in Indonesia for over 30 years. The cumulative results of that engagement are evident throughout the sector – from the major pieces of legislation governing the sector – to USAID built power plants – to the plethora of senior energy sector officials trained through USAID supported programs. USAID has had a lasting impact in the sector and is very well regarded by all major stakeholders. This history places USAID in an excellent position to reengage in the sector.
- Flexibility to work with a variety of stakeholders – Several of the major energy sector donors are restricted to providing loans or TA directly to national government entities. USAID's flexibility to work directly with sub-national governments, NGOs, private sector developers, and other key energy sector stakeholders provides a significant advantage to craft solutions to Indonesia's energy sector challenges.
- Focus on Technical Assistance – USAID's technical assistance programs could compliment the investment focused programs of the MDBs in the energy sector.
- Willingness to work behind the scenes – Several of the key barriers to clean energy development in Indonesia, such as energy subsidies, are sensitive political issues where outside influence is not generally welcomed. USAID has a track record of being able to work behind the scenes to support Indonesian-led reform efforts on a variety of politically sensitive topics.
- Geographical Flexibility – Many large donor supported energy programs are focused on improving operations on the central Java-Bali grid. USAID's willingness to focus on other Islands compliments these efforts and could provide much needed support to historically neglected systems with high operating costs, poor efficiency, and significant renewable energy potential.

- Unique capabilities/investment interests of US Industry - The US private sector is widely regarded as a world leader in clean energy development and several clean energy companies have expressed interest in investing in Indonesia as well. USAID can partner with these private sector entities to share proven solutions to clean energy development with Indonesian counterparts.

### **6.1.2 OPPORTUNITIES AND EXPECTED OUTCOMES**

The Indonesian energy sector offers a very wide range of opportunities for controlling the carbon intensity of development while promoting sustainable development and economic growth. These opportunities include developing the potential of geothermal, hydropower and renewables, addressing policy distortions that affect energy consumption and investment, developing biofuels responsibly, improving power generation efficiency, enhancing end-use energy efficiency in various sectors, considering alternative urban transport options, and accelerating the adoption of new technologies. Addressing climate change and energy issues will also generate secondary development benefits and improve quality of life, such as cleaner air in cities and homes, reduced congestion, better waste management, and greater efficiency. Indonesia can also take advantage of opportunities for low-carbon development because it has substantial renewable energy resources (geothermal, hydropower), good potential to tap existing carbon markets through CDM and energy efficiency improvements. Energy diversification through renewable energy and energy efficiency coupled with policy and regulatory reform and improvement of energy efficiency could help to meet growing demand in Indonesia, reduce dependence on expensive imported fuels, and reduce the growth of GHG emissions

Opportunities for USAID support can be categorized in three major areas:

- 1) Policy Reform, Coordination and Implementation
- 2) Energy Efficiency and Renewable Energy
- 3) Other Energy Sector Programs

Details on each of these program areas are provided below. Although each category is treated separately, there is significant interplay and synergies between the three components.

#### **6.1.2.1 POLICY REFORM, COORDINATION AND IMPLEMENTATION**

##### **6.1.2.1.1 ELECTRICITY TARIFF REFORM**

The electricity tariff in Indonesia has been fixed since 2003 and has a dramatic impact on all aspects of clean energy development. The current tariff is not cost reflective even in the lowest cost Java-Bali network and is nearly 80% below costs in many diesel based isolated networks. Some of the negative impacts of this tariff include:

- a. A strong disincentive for PLN to connect any new customers because of their inability to recoup the cost of service in rural areas
- b. A significant strain on the fiscal space of the Indonesian government with overall electricity subsidies around 88 trillion IDR per year (2% GDP) in 2008.
- c. Inability of IPPs to obtain financing because of lenders concern about the fiscal health of PLN

- d. Disincentive for PLN to add any renewable generation technology that could increase the cost of generation.
- e. Disincentive for effective DSM and energy efficiency practices (e.g. reduction in fuel subsidies led to a 9% reduction in domestic oil use in 2005).
- f. Inability of PLN to make capital investments needed to improve system efficiency.

The electricity tariff is a regressive subsidy with the poorest 10% of households in Indonesia receiving Rp 900 billion in 2005, while the richest 10% received Rp 1.3 trillion. Increase of the electricity tariff is a politically charged topic which has repeatedly been delayed in favor of political expediency. In 2004, plans to increase the tariff to \$0.08/kWh were scrapped as a result of the pending elections. Several stakeholders believe that one of the best opportunities for increasing the tariff will be during the first two years of a new administration. With elections scheduled for 2009, the time might be right to support an electricity tariff reform program, focused on impact analysis, TA, and a public information campaign targeting specific stakeholders known to oppose tariff increase.

Expected Outcomes - Electricity tariff reform is the single most important factor which could lead to accelerated clean energy development in Indonesia. Although progress will be incremental, the cost of implementing such a program is trivial compared to the benefit of addressing the myriad of clean energy development barrier detailed above. Building sufficient consensus and the political will required to implement the current plans for a 30% tariff increase in 2010 would be an important first milestone for this program.

Risks – Electricity tariff reform is well beyond the manageable interest of USAID and an investment may not lead to short term tangible results. Such a program would be high risk and progress may be incremental and slow.

#### **6.1.2.1.2 LOW CARBON STRATEGY DEVELOPMENT AND CLIMATE CHANGE**

Indonesia's political, planning, and budgeting calendars and recent institutional changes and developments are creating strategic opportunities for engagement on climate change issues with the GOI. In conjunction with the newly elected administration in 2009, the GOI will be developing a new strategic plan for the period 2009-2014 that provides the opportunity to integrate global climate change concerns with strategic choices for sustainable development involving energy sector investments, policy reforms, and inter-ministerial coordination. The National Council for Climate Change (NCCC), established in July 2008 now serves as the new focal point for climate change in Indonesia (replacing the Ministry of Environment) and will be taking on responsibilities for formulating integrated national policies, strategies, programs and actions for climate change mitigation as well as technology transfer and funding. The Ministry of Finance has become a major decision maker with an increasing interest in global climate change issues. It leads an inter-ministerial working group that develops analyses and capacity on climate change and low carbon issues and is designing and raising capital for a new \$US250 million Indonesia Clean Technology Fund for clean technology projects in Indonesia. The MOF will likely also be the lead coordinating Ministry for preparing proposals to access funds from the World Bank Clean Technology Fund, which could lead to the leverage of billions of dollars in private sector investments in clean technology in Indonesia.

These new institutional developments and heightened international attention of the global climate change donor community on Indonesia has created demands on the existing institutional structure of the NCCC and MoF and these institutions are straining to be able to manage donor interest and participation effectively and efficiently.

USAID might consider engagement with the GOI on several fronts including:

### **1. Technical assistance and capacity building with the National Council for Climate Change**

As a new, inter-ministerial institution, USAID could engage with the Council by providing much needed institutional strengthening to develop the institutional capacity of the council and technical assistance to enhance its capabilities.

- Provide a high-level technical and institutional advisor to the commission to provide policy advice and analytical and coordinating support, particularly in assisting the commission with its coordinating function of organizing donor assistance.
- Assist commission to develop, analyze and implement low carbon development strategies and policies designed to promote enabling environments and incentives for new investment, conservation, or renewable energy resources to attract private investment
- Assist the Council to develop the necessary institutional and regulatory framework needed to benefit from anticipated increased international public and private capital flows to create sound incentives, provide resources for programs, with in the context of contributing to sustainable development
- Providing a capacity building program for the Council to enable multi-stakeholder decision making and enhance the coordination and coordinating capabilities.
- Institutional High level assistance to the Ministry of Finance
- Provide the Ministry of Finance with technical assistance and support to effectively assess and access the newly established and potential new international financing mechanisms and sources that can be used to finance climate-friendly investments, preparatory analyses, and incentives or seed money for innovations.
- Assistance with the development of pipeline of clean technology projects and programs for the CTF and Indonesian CTF
- Technical assistance to enhance the analytical capacity of the Ministry to engage on environmental and climate change issues.
- Expand capacity for use of GHG accounting and reporting practices

### **2. Expand local capacity for use of GHG accounting and reporting practices for clean energy activities**

Provide technical assistance to USAID program implementers as well as government, academic, and private sector partners for GHG accounting and reporting practices for clean energy activities. GHG accounting is an essential initial step toward the development of credible and effective programs for tackling climate change. In partnership with the Council, The GHG Protocol, a program supported by USAID for the past 10 years, offers developing countries an internationally accepted management tool to help their businesses to compete in the global marketplace and their governments to make informed decisions about climate change. By adopting and implementing international accepted practices for greenhouse gas emissions accounting, local stakeholders will be in a better position to manage emissions, identify and quantify emission management and mitigation improvements and will be better prepared to

participate in and attract future financing from the emerging and expanding carbon markets. This program, implemented as a voluntary business program through country business associations, trade groups and environmental and efficiency minded local businesses has been successfully implemented with USAID support including several Asian countries such as India and the Philippines and have helped both private and public sector organizations to quantify emissions from their business activities and operations and identify mitigation projects.

**Expected Outcome:**

- Improved sector coordination and planning could play an important role in the realization of Indonesia's progressive clean energy agenda. The lack of coordinated policy formation is one of the primary reasons that there is such a large gap in Indonesia between policy formation and implementation
- Enhanced realization of development benefits such as economic growth, attracting new private sector investments, greater energy efficiency, energy security, additional fiscal resources for clean energy development, and potentially revenues from GHG emissions reductions
- The Global Climate Change policy dialogue would be scaled up and would more effectively integrate low carbon options into near and medium term development plans.
- Building understanding and acceptance of commitments into planning and budgeting documents will help to ensure continuity on key priority issues.

**Risks:**

- The sector is crowded with donors including the World Bank, DANDIA and the Dutch who are all directly engaged with GOI on global climate change issues, including capacity building and CDM.
- For the next year, Indonesia will be focused on national elections scheduled for mid-2009. This poses risks for focus and integration of high level assistance in the formal GOI processes and institutions.
- A change of government in the next election cycle could lead to an administration less willing and able to adopt and implement the reforms needed for a serious response to climate change. However, any new government would also have to deal with the increasing global political pressure around climate change issues, especially as the post 2012 period and a new climate change agreement approaches.

**6.1.2.1.3 ENERGY SECTOR COORDINATION AND PLANNING**

Clean Energy Development in Indonesia is hampered by the multitude of Agencies which have jurisdiction over different aspects of the energy sector. These entities often have overlapping responsibilities and poor coordination. Private sector Geothermal developers cited the lack of a "one-stop-shop" as one of the most significant barriers to geothermal development in Indonesia. In order to address this challenge, the GOI has recently established a high level multi-stakeholder National Energy Council for energy – the DEN. Unlike the previous incarnation of a planning commission (BAKOREN) which was contained within the Ministry of Energy, the DEN is chaired by the president which may give it the influence to make substantive improvements in the coordination of energy policy. USAID might consider providing support to the DEN through:

- Assisting the Commission in the formulation of a sector-wide road map for new and renewable energy development to consider aspects of technology, financial, investment viability, and environmental sustainability for the national Energy Master Plan.
- Assisting the Commission in the preparation of an Energy Crisis Response Strategy to lay a good foundation for national energy security.
- Assisting the Commission in preparing an implementation plan for policy enforcement on renewable energy development and energy efficiency including consideration of incentives and punishment.

Expected Outcomes: Improved sector coordination and planning could play an important role in the realization of Indonesia's progressive clean energy agenda. The lack of coordinated policy formation is one of the primary reasons that there is such a large gap in Indonesia between policy formation and implementation.

Risks: Since the DEN has only been in existence for a few months it is too early at this point to determine whether it will be an effective coordinating body with the full force of the president behind its decisions or just another ineffective bureaucratic institution. The majority of stakeholders interviewed acknowledged the need for such an institution but believed it would tend towards the latter. Support for this institution should only be considered once a clearer indication of its capacity and effectiveness are demonstrated.

#### **6.1.2.2 RENEWABLE ENERGY DEVELOPMENT AND ENERGY EFFICIENCY**

##### **6.1.2.2.1 RENEWABLE ENERGY DEVELOPMENT**

Decentralized renewable energy systems remain the most cost-effective options in many rural areas and should attract private investment as the government continues to address the regulatory framework for selling power to PLN. Indonesia's geography and natural resources provide some of the most favorable conditions for renewable energy development in the world. Although Indonesia has made progress developing some of its geothermal and hydro resources, significant opportunity remains. One particular area of opportunity is to develop renewable resources to power some of the 600 mini-grids operated by PLN outside the Java-Bali network. PLN operates a total of 4700 diesel gensets comprising 44% of outer Jamali generation capacity. Development of renewable resources for these isolated grids has three advantages: 1) provides additional generation capacity in rural areas which will allow PLN to extend the grid to unserved areas, 2) provides a cheaper alternative to the currently used diesel generation allowing PLN to reduce operating costs, and 3) provides a low carbon alternative to fossil fuel based generation to meet Indonesia's growing electricity demand.

The following activities could greatly enhance the utilization of Indonesia's abundant renewable resources:

- Develop standard PPAs for renewable energy: PLN is currently decentralizing contractual responsibilities for small and medium IPP projects (below 10 MW) to its subsidiaries/regional units in order to be more proactive in identifying renewable project opportunities and more responsive in evaluating renewable energy IPP proposals. Unfortunately, PLN regional units and sub-national governments do not have the capacity to prepare and execute IPP transactions that will be bankable even to the domestic banking standards. USAID should consider a program to assist PLN (or local governments in case of geothermal energy) in establishing best practice models for structuring and executing renewable energy IPP



transactions and develop standard bankable PPA agreement formats for small-scale power producers for select RE sources.

- **Promote Competitive Bidding for Large and Small Scale IPPs:** To accelerate the utilization of renewable energy resources, the Ministry of Energy has allowed PLN to skip competitive selection of IPP project developers and instead conduct direct selection. The direct selection process diminishes competitiveness and transparency and has been shown in several countries to increase the overall price of services. Lack of transparency in sponsor selection also limits the participation from credible commercial banks and multilateral banks, who avoid risking their reputation by being involved in opaque transactions. USAID has the opportunity to assist PLN to develop a standardized application procedure for RE developers that should be implemented at PLN regional units.
- **Support Reference price for local IPPs:** One barrier to the development of renewable energy resources has been PLN's unwillingness to transparently disclose its current generating costs which form the basis for PPA price negotiation. Recently, The Ministry of Energy has issued the local grid costs of services – a critical step in rectifying this problem. Develop a differential pricing scheme for each district (wilayah) for different renewable energies (and possibly for different scales). The availability of these reference prices also provides a foundation for the implementation of non-uniform retail electricity tariff, allowing PLN to recoup the cost of electricity services from the local consumers, and ultimately will enforce the cost recovery principle in the electricity sector.
- **Support Credit Enhancement Programs:** Government support on political risk (e.g. government force-majeure events) and demand risk (risk of default in take-or-pay PPAs) are the most sought-after facility in Indonesian project financing and thus, their availability will accelerate the project closing and have the potential to decrease the PPA price for PLN. USAID should consider a capacity building program for the Risk Management Unit of the Ministry of Finance to evaluate and evaluate a government guarantee for renewable energy projects. If PLN prepares and executes the selection of sponsors and enters into a contractual relationship in accordance with the PPP regulation, PLN will have the opportunity to add a credit enhancement facility to the project structure, thus making the renewable energy project more bankable. USAID should also consider providing a 50% loan guarantee (DCA) to encourage domestic financing of small scale clean energy projects.
- **Support a clean energy project acceleration facility** to build capacity and understanding among project developers and investors, financiers, and other sources of finance and to develop a pipeline of viable, bankable clean energy projects. Engage in technical assistance, awareness-raising, Investor Forums, and facilitation of contacts and networking between entrepreneurs and project developers on the one hand, and investors and financiers on the other to provide targeted assistance to project developers to improve the viability and marketability of their projects to potential investors.
- **Develop Hybrid System Models for PLN's Diesel Generation:** PLN currently owns and operates 4700 diesel gensets. The low tariff and high cost of diesel generation results in a revenue loss for each one of these systems. PLN has already piloted some wind/diesel hybrid systems and USAID should consider providing technical assistance to enable the wide scale deployment of hybrid systems which will reduce operating costs and carbon emissions.

Risks: Success on each of these program elements will require cooperation and support from PLN. Although there is no guarantee that PLN will decide to negotiate transparently or reform past practices, several factors suggest that the time may be right for such a program. The World Bank is about to launch a rural electrification loan to PLN for grid expansion and believes this can provide a critical leverage point for the associated generation capacity to be procured competitively. The decentralization of contract authority within PLN also allows for targeting of some of the more progressive regional managers in the early stages of this program. The Ministry of Finance is about to launch a clean tech fund which would provide mezzanine financing for small scale renewable projects. The presence of the Ministry of Finance at the negotiation table could help to improve the transparency of PPA negotiations.

Expected Results: Renewable generation capacity could significantly reduce PLN's reliance on diesel generation to meet the power requirements of isolated grids. In addition, augmenting the generation capacity in rural areas with lower cost sources will provide an incentive for PLN to expand coverage to Indonesia's unserved populations.

#### **6.1.2.2.2 ENERGY EFFICIENCY AND DSM**

Energy efficiency improvements and distribution system upgrades are often cited as the most cost effective option for reducing energy demand and energy sector carbon emissions. The energy intensity of Indonesia's economy surpasses most Asian countries, with a 1% increase in GDP resulting in a 1.8% increase in energy demand. This section outlines opportunities for USAID to work with Industry and PLN to reduce the energy intensity of the economy and improve overall system performance.

##### **1) Industrial Energy Efficiency:**

Table 1 demonstrates that nearly all of Indonesia's major industries are more energy intensive than competing countries. While electricity subsidies provide a major barrier to energy efficiency programs, industrial audits show that even under the current tariff structure there are many retrofits which could be made with a payback period of 1-3 years. To date, however, there have been volumes of energy efficiency audits conducted with little implementation.

- Assist in the implementation of an energy conservation program in identified small- to medium-scale industrial sectors to include technical assistance on implementation of energy audits.
- Assist in formulation of possible incentive schemes for demand-side energy management programs in the industrial and commercial sectors.
- Assist in the establishment of energy consumption standards for specific industrial sector (USAID once provided assistance for formulation of National Standards related to energy conservation in buildings).
- Provide a capacity building program and assistance for financial institutions and the industrial sector to increase the viability and attractiveness of energy conservation program financing.

**Table 1: Comparison of Energy Intensity of industrial Sub-sectors in Indonesia and competing countries**

Industry	Country	Energy Intensity	Unit
Iron and Steel	Indonesia	700	kWh/ton
	India	604	
	Japan	500	
Ceramic	Indonesia	16.6	GJ/ton
	Vietnam	12.9	
Tire	Indonesia	8,100	Kcal/kg
	Thailand	7,000	
Cement	Indonesia	800	Kcal/kg clinker
	Japan	773	
Glass	Indonesia	12.4	GJ/ton
	South Korea	10.2	

#### 1) PLN Efficiency Improvements:

Although PLN's overall system losses are reported to be quite low (10%), system performance varies greatly by region and there is significant opportunity for loss reduction in many of the regions outside of Java-Bali. PLN's implementation of distribution system energy efficiency programs has faced the following barriers:

- Most PLN regions are unable to perform medium-term forward planning. The distribution master plans, if any, are not updated and not implemented. Management of distribution system will benefit from a medium term master planning review to correctly identify reinforcement requirements caused by progressive load growth over preceding years.
- Most PLN regional staff have historically focused on grid expansion and lack the knowledge and skills to analyze and determine solutions to network quality problems (e.g. finding optimum location for capacitor bank installations and deciding whether to upgrade transformers or rewire distribution lines).

USAID should consider providing PLN regional units with the follow support to address these barriers:

1. Technical assistance on distribution system analysis and design and project management to implement energy efficiency projects, including procurement of modern distribution planning and modeling software;
2. Pilot project in distribution energy efficiency outside Java-Bali regions, taking best practice experiences from the US or other successful program in developing countries.

Intervention should be coordinated with the World Bank, which is working with MEMR and PLN on improving electricity access for rural areas, and ADB, which is planning to finance PLN energy efficiency project in Java-Bali regions. USAID might want to focus on regions outside Java-Bali.

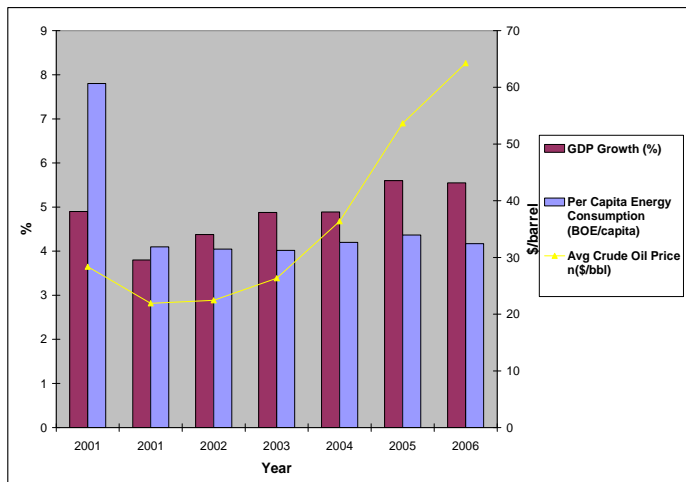
#### **6.1.2.3 OTHER ENERGY SECTOR OPPORTUNITIES**

Several other non-electricity components of the energy sectors are major contributors to greenhouse gas emission and warrant consideration for support. The transport sector is a major emitter of fossil fuel based greenhouse gases and is growing rapidly. Most of these emissions come from vehicle use, with key issues being the vehicle emissions standards and fuel quality standards currently in use. (Growth in vehicle ownership is also an issue, though expected for a developing country and less amenable to policy intervention.) Although standards have been set they have not been implemented and the rapid increase in the number of vehicles is creating a new stock of vehicles that will only contribute further to growing emissions. Indonesia is well behind the region in terms of fuel quality standards and vehicles are not now complying with Euro 2 emissions standards. USAID should consider providing support for Indonesia in the development of fuel standards and transportation planning. USAID's past support of the dedicated bus lane in Jakarta is considered a success and could be replicated in other population centers in Indonesia.

As the USAID/Indonesia Health and Environment program strategy develops, opportunities for cross-sectoral energy/environment/health programming should be maximized. For instance, development of institutional or household biogas systems can help improve sanitation, reduce deforestation, and reduce carbon emissions, and improve indoor air quality. Improved watershed management is a requirement for small scale hydro operation providing another opportunity for synergies between a future environment and energy program.

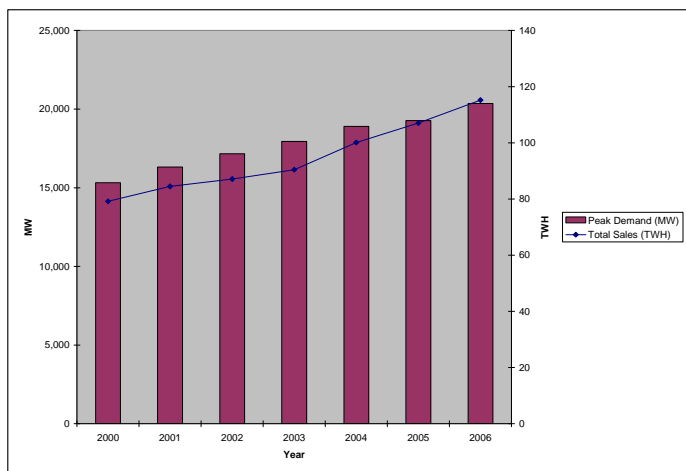
## 7 34HAPPENDIX A: ADDITIONAL FIGURES AND TABLES

**Figure A1: GDP Growth, per Capita Final Energy Consumption, and Oil Prices, 2001-2006**



Handbook of Indonesia's Energy Economic Statistics, 5th edition (2007)

**Figure A2: Peak Demand and Electricity Consumption Growth, 2001-2006**



**Table A1: Fuel and Electricity Subsidies****Fuel Subsidy in Indonesia (2005-2009)**

	2005	2006	2007	2008 (estimate)	2009 (forecast)
Fuel Subsidy (trillion IDR)	95.6	64.2	83.8	180.3	179.1
Percent of GDP (%)	3.4	1.9	2.1	3.9	3.4
Parameters:					
Average Indonesian Crude Oil Prices (\$/barrel)	53.4	64.3	72.3	127.2	130
Average Exchange Rate (US\$/IDR)	9,705	9,164	9,140	9,250	9,100

Source: Ministry of Finance, 2008

**Electricity Subsidy in Indonesia (2005-2009)**

	2005	2006	2007	2008 (estimate)	2009 (forecast)
Electricity Subsidy (trillion IDR)	8.9	30.4	33.1	88.4	78.9
Percent of GDP (%)	0.3	0.9	0.8	1.9	1.5
Parameters:					
Average Indonesian Crude Oil Prices (\$/barrel)	53.4	64.3	72.3	127.2	130
Average Exchange Rate (US\$/IDR)	9,705	9,164	9,140	9,250	9,100

Source: Ministry of Finance, 2008

	2005	2006	2007	2008 (estimate)	2009 (forecast)
Fuel Subsidy (trillion IDR)	95.6	64.2	83.8	180.3	179.1
Electricity Subsidy (trillion IDR)	8.9	30.4	33.1	88.4	78.9

Figure A3. Fuel and Electricity Subsidies

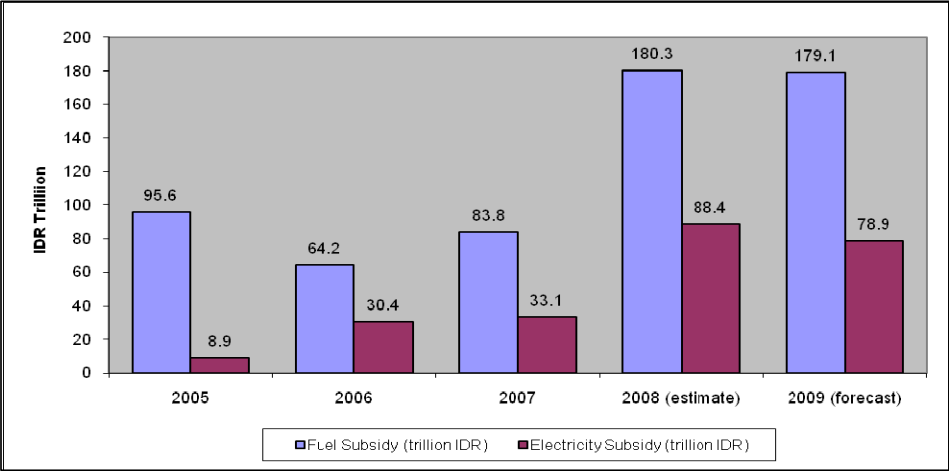
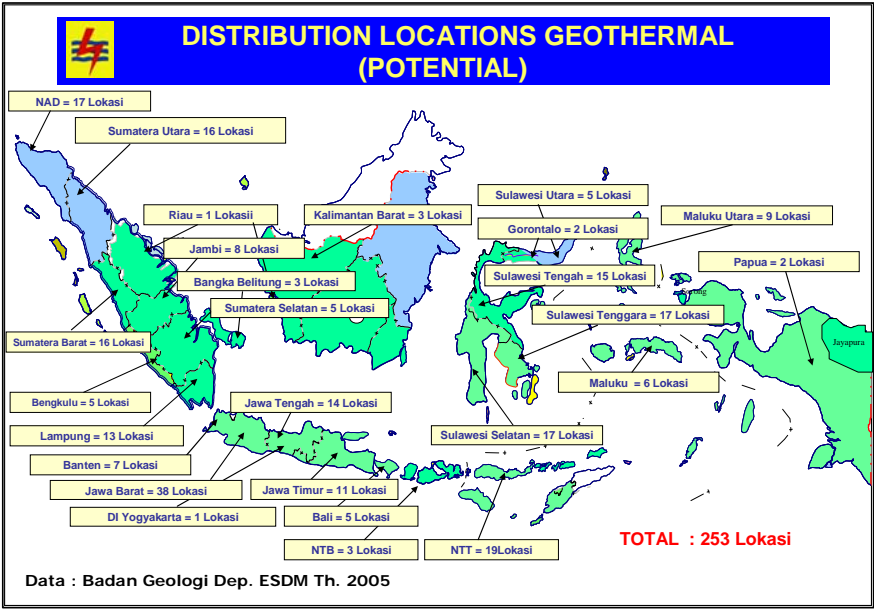


Figure A4: Distribution of Geothermal Potential across Indonesia (Agus 2006)



**Table A2: Energy Resources by Region within Indonesia**

Region	Energy resources				
	Coal	Natural gas	Crude oil	Geothermal	Hydro
	[million tons of coal equivalent (TCE)]	[billion standard cubic feet (BSCF)]	[million barrel of oil equivalent (BOE)]	[location]	[megawatt (MW)]
Jawa	17	9,479	1,319	116	34
Bali				5	20
Sumatera	28,613	22,174	5,675	93	5,490
Nusa Tenggara				21	292
Kalimantan	34,485	83,895	920		6,047
Sulawesi	235	3,654	81	50	4,479
Maluku				15	217
Papua	62	14,782			24,974
Total	63,412	133,984	7,995	300	41,553

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Figure A5: Indonesia's Generating Capacity by Type of Owner

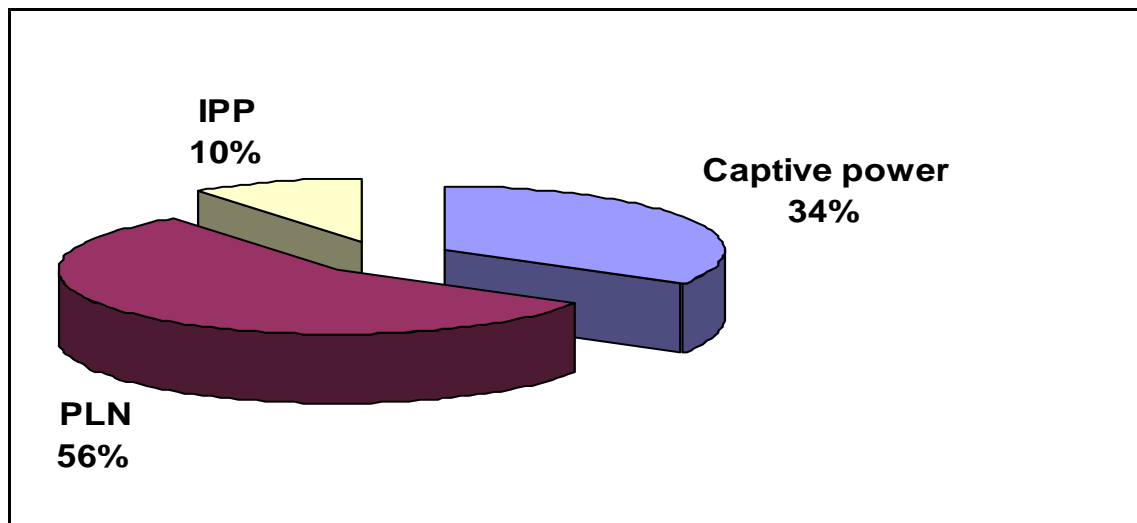
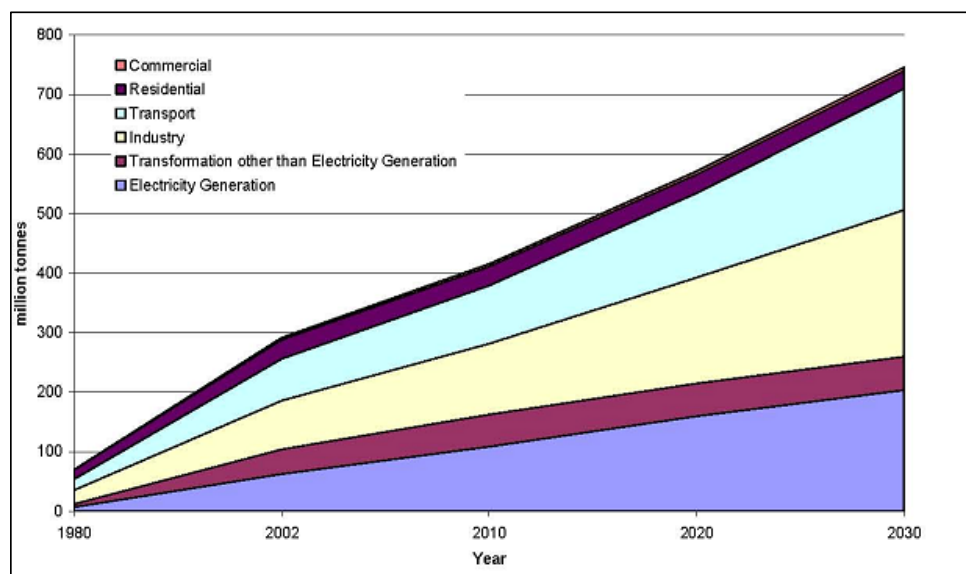


Figure A6: Total final energy demand by source



**Table A3: Energy decrees, regulations, policies and laws in Indonesia**

Law	Date Enacted	Purpose
Law No. 30/2007 on Energy	2007	<ul style="list-style-type: none"> <li>▪ Outlining guiding principles of national energy management</li> <li>▪ Government and local government still need to provide subsidy for the poor</li> <li>▪ Prioritizing the use of environmental-friendly technology</li> <li>▪ Establishment of National Energy Council</li> <li>▪ Incentive for consumers and manufacturers of energy-saving appliances</li> </ul>
Law No. 22/2001 on Oil and Gas	2001	<ul style="list-style-type: none"> <li>• Stipulates that downstream oil and gas operations, including processing, transportation, storage, and marketing of oil fuel products shall proceed in a transparent manner.</li> <li>• Pricing mechanisms are to be based on market prices</li> <li>• Provides investors equal regulatory and legal treatment.</li> </ul>
Law No. 27/2003 on Geothermal Power	2003	<ul style="list-style-type: none"> <li>▪ Provides regulatory certainty to the geothermal industry.</li> <li>▪ Defines new rules under which exploration and development can occur using a competitive bidding process to grant three-year licenses for exploration with possible two year extensions to complete feasibility studies.</li> </ul>
Law No. 15/1985 on Electricity	1985	<ul style="list-style-type: none"> <li>• Govern generation, transmission and distribution of electricity.</li> </ul>
Law No. 10/1987 on Nuclear Power	1987	<ul style="list-style-type: none"> <li>• Construction of commercial nuclear power plant is the authority of the Government after consultation with the Parliament.</li> </ul>
Law No. 22/1999 and No. 25/1999 on Regional Autonomy	1999	<ul style="list-style-type: none"> <li>• Give regional government greater role in natural resource management in their respective regions.</li> <li>• Each region can adjust energy sector management to conform to its own socio-economic condition and the availability of energy resource in the particular region.</li> </ul>
Government Regulation No. 3/2005 on Supply of Electricity	2005	<ul style="list-style-type: none"> <li>• Supports law No. 15/1985 on electricity, which was reenacted late 2005 following Constitutional Court ruling that annulled Law No. 20/2002 on electricity.</li> </ul>

Law	Date Enacted	Purpose
		<ul style="list-style-type: none"> <li>Private sector must partner with PLN to develop electricity projects.</li> <li>However, companies generating power for their own use or those using renewable energy can set-up plants independently without having to partner with PLN.</li> </ul>
Presidential Regulation No.5/2006 on National Energy Policy	2006	<ul style="list-style-type: none"> <li>Set energy diversification targets for 2025 that include 5% share for biofuel and 5% share for geothermal and other renewables.</li> <li>Sets target to reduce energy intensity by 1% per year.</li> </ul>
Presidential Decree No.1/2006 on Supply and Use of Biofuel	2006	<ul style="list-style-type: none"> <li>Set targets for biofuels utilization.</li> </ul>
Presidential Decree No. 2/2006 on The Utilization of Liquefied Coal as Alternative Fuel		<ul style="list-style-type: none"> <li>Intensification of liquefied coal as alternative fuel</li> </ul>
Ministerial Regulation No. 2 on Medium Scale Power Generation from Renewable Energy Sources	1/2006	<ul style="list-style-type: none"> <li>Extends the same price guidelines as MD No. 1122/K/30/MEM for projects from 1 MW to 10 MW</li> <li>Sets a minimum contract period of ten years.</li> </ul>
MEMR Regulation 8/2005	2005	<ul style="list-style-type: none"> <li>Seeks to attract private investments in oil and gas exploration.</li> <li>Allows an additional 20 percent cost recovery for developers of marginal oil and gas fields.</li> <li>Offers more favorable split to contractors for oil and gas development in the 2005 bidding round.</li> </ul>
Ministerial Decree No. 1122/K/30/MEM/2002 on Small-Scale Power Purchase Agreement	2002	<ul style="list-style-type: none"> <li>Requires PLN to purchase electricity generated from renewable energy sources by non-PLN producers for projects up to 1 MW capacity.</li> <li>Institutions eligible to participate are cooperatives, private enterprises, and government companies.</li> <li>Purchase tariffs will be calculated at 80% for medium voltage and 60% for low voltage of PLN's announced "Electricity Base Price" which is supposed to be its marginal production cost at the location where the plant is to be built.</li> </ul>

**Table A4: Energy Conservation and efficiency decrees, regulations, and policies in Indonesia**

Law	Date Enacted	Purpose
Presidential Instruction No. 2/2008 on Energy and Water Conservation	2008	<ul style="list-style-type: none"> <li>▪ Instruction to government agencies to conserve energy on lighting, air conditioning, fuels and electricity based appliances and transportation.</li> <li>▪ Establishment of National Team on Energy and Water Conservation chaired by Coordinating Ministry of Economics for policy and strategy formulation on energy – water conservation.</li> </ul>
Presidential Instruction No. 10/2005 on Energy Conservation	2005	<ul style="list-style-type: none"> <li>• Instruction to all government agencies at all levels to conserve energy on lighting, air conditioning, fuels and electricity based appliances and transportation.</li> <li>• The implementation must be reported to the Minister of Energy and Mineral Resources every six months.</li> </ul>
MEMR Regulation No. 31/2005 on Guidance for Energy Conservation	2005	<ul style="list-style-type: none"> <li>▪ Providing technical guidance in accordance to Presidential Instruction No. 10/2005</li> <li>▪ Providing actions for implementation for commercial, public, industry and households sectors.</li> </ul>

**Table A5: Targets for Renewable Energy Development through 2025**

Type of Energy	Unit	2010	2015	2020	2025
Geothermal	MW	3,442	4,600	6,000	9,500
Wind	MW		25.6		255
PV	MW	25	50	70	80
Micro Hydro	MW	169	298	488	700

**Table: A6: Plants operating under PSK Tersebar in 2005**

	Installation	Price	Comments
1	Micro Hydro Curung Agung, 12 kW, Subang, West Java	Rp 432/kWh	<ul style="list-style-type: none"> <li>• 60% marginal production cost for low voltage</li> <li>• Yearly extendable contract</li> </ul>
2	Micro Hydro Cinte Mekar, 100 kW, Subang, West Java	Rp 432/kWh	<ul style="list-style-type: none"> <li>• 60% marginal production cost for low voltage</li> <li>• Yearly extendable contract</li> </ul>
3	Micro Hydro Waikelosawah, 14 kW, West Sumba, NTT	Rp 218/kWh	<ul style="list-style-type: none"> <li>• Not in line with PSK Tersebar</li> <li>• In process of adjusting price</li> </ul>
4	Micro Hydro, 25 kW, Mojokerto, East Java	Rp 341/kWh	<ul style="list-style-type: none"> <li>• 80% marginal production cost for medium voltage</li> <li>• Marginal production cost reduced from first year</li> </ul>

**Table A7: Benchmark Tariffs**

Benchmark tariffs that have been established by the DG for Electricity and Energy Utilization. PSK/PSM tariff are set at 60% of the benchmarks (interconnection at low voltage = TR in table) and 80% (interconnection at medium voltage = TM in table).

No.	Sistem Kelistrikan	Sub-Sistem	BPP-TT (Rp/kWh)	BPP-TM (Rp/kWh)	BPP-TR (Rp/kWh)
1.	Sistem Sumatera Bagian Utara	Nanggroe Aceh Darusalam	1,891	2,158	2,603
		Sumatera Utara		1,984	2,306
2.	Sistem Sumatera Bagian Selatan- Sumatera Barat-Riau	Sumatera Barat	565	790	1,044
		Riau		1,164	1,433
		Sumatera Selatan, Jambi, dan Bengkulu		696	869
		Lampung		667	860
3.	Sistem Bangka Belitung	Bangka Belitung	-	2,476	2,919
4.	Sistem Kalimantan Barat	Kalimantan Barat	2,312	2,546	3,143
5.	Sistem Kalimantan Selatan dan Kalimantan Tengah	Kalimantan Selatan, dan Kalimantan Tengah	1,148	1,611	1,998
6.	Sistem Kalimantan Timur	Kalimantan Timur	1,732	1,965	2,260
7.	Sistem Sulawesi Utara, Sulawesi Tengah, dan Gorontalo	Sulawesi Utara, Sulawesi Tengah, dan Gorontalo	974	1,676	2,063
8.	Sistem Sulawesi Selatan, Sulawesi Barat, dan Sulawesi Tenggara	Sulawesi Selatan, Sulawesi Barat, dan Sulawesi Tenggara	1,103	1,249	1,505
9.	Sistem Maluku, dan Maluku Utara	Maluku, dan Maluku Utara	-	2,320	2,919
10.	Sistem Papua	Papua	-	2,526	3,192
11.	Sistem Nusa Tenggara Barat	Nusa Tenggara Barat	-	2,289	2,743
12.	Sistem Nusa Tenggara Timur	Nusa Tenggara Timur	-	2,433	3,072
13.	Sistem Jawa-Madura-Bali	Bali	783	859	1,012
		Jawa Timur		855	1,030
		Jawa Tengah, dan DI. Yogyakarta		849	1,011
		Jawa Barat, dan Banten		853	1,024
		DKI Jakarta, Tangerang		850	1,005



# 8 35H36H37H38H39H40H41H42H43H44H45H 46H47H48H49H50H51H52H53H54H55H56H 57H58H59H60H61H62H63H64H65H66H67H 68H69H70H71H72H73H74H75H76H77H78H 79H80H81H82H83H84H85H86H87H88H89H 90H91H92H93H94H95H96H97H98H99H100 H101H102H103H104H105H106H107H108H 109H110H111H112H113H114H115H116H117 H118H119H120H121H122H123H124H125H1 26H127H128H129H130H131H132H133H0F REFERENCES

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